

# AUTOMOTIVE INDUSTRIES

*The* AUTOMOBILE

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Number 16

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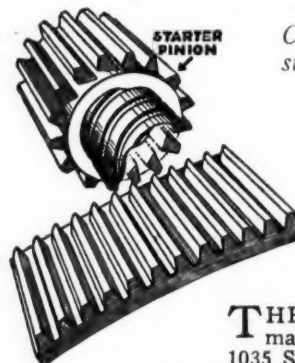
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# LOGANGEARS

# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

VOL. XLVIII

NEW YORK—THURSDAY, APRIL 19, 1923

No. 16

## Car Makers Striving to Escape Higher Retail Prices

They realize that advances will restrict sales but rising manufacturing costs make situation difficult. Industry has profited by fair treatment of consumer. Fall better time than summer for revision of lists. All parties protest British rubber restrictions.

By James Dalton

**P**RICE considerations are looming large in the minds of motor vehicle manufacturers. They don't want to increase them and won't unless they have to for conserving reasonable profits.

This sane and constructive attitude is in marked contrast to that assumed in many other lines of manufacture, and which is partly responsible for the return of the "vicious cycle," which may lead to inflation.

**Notwithstanding materially increased production costs, automobile makers have made few changes in their lists since January, 1922.**

The wisdom of this policy is reflected in the enormous sales which have been made month by month for more than a year. It took the automotive industry several months in 1920 to realize that the bottom was dropping out of sales, but when it did grasp the full significance of the situation it swallowed its bitter medicine, accepted tremendous inventory losses without sobbing bitterly about its wrongs, and cut prices to the bone.

Henry Ford, a real business strategist, led the way and other makers promptly followed. Prices dropped steadily for months. There might have been a little less demoralization if the operation had been performed all at once instead of on the installment plan, but every cut brought more buyers into the market.

When the industry found that deflation was unavoidable it made a good job of it. As a result it was

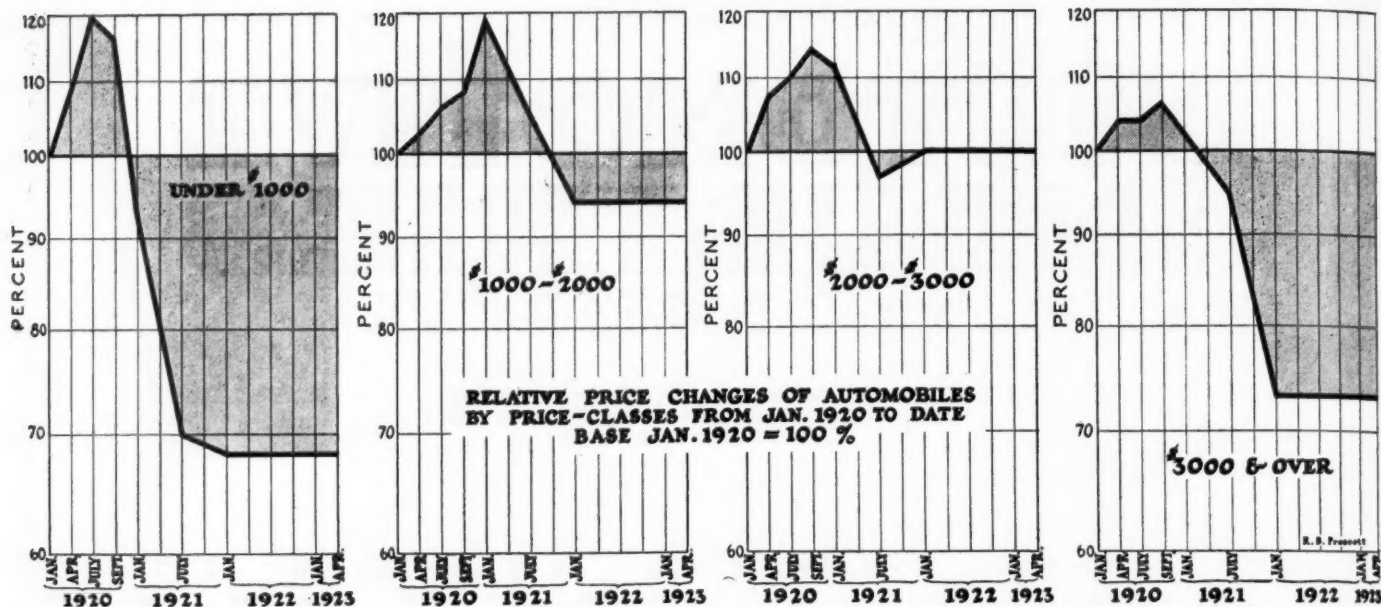
one of the first to recover. After the ghoulish predictions of certain financial interests, the speed of its come-back was little short of marvelous. There wasn't much profit in the business, either for vehicle makers or parts manufacturers, because high-priced materials were being sold for less than they cost, but it kept the factories going. Best of all, when the business tide really turned, they had all their losses, staggering as they were, behind them and could take a substantial profit on current sales.

**B**ALANCE sheets for last year demonstrate that the public had plenty of money to buy products which it believed were priced right. Automobile retail prices settled down to rock bottom after the national shows in January of 1922 and they have remained at practically the same level ever since.

**Result:** The biggest year's business in the history of the automotive industry, so far as passenger cars were concerned.

Manufacturers' profits were large, although not the biggest on record in volume or per unit for some companies. Others, on the other hand, established new earning records. It must be admitted, however, that the parts makers did not have such a satisfactory year, and they undoubtedly have been justified in revising their prices upward so their profits will show a better balance with the volume of business done.





There may be some justification for the contention of the producers of units that it is no more than fair that vehicle manufacturers should be content this year with a smaller margin of profit. If present volume can be maintained and there are no genuine runaway material markets, it certainly will be true.

Production costs have risen rather sharply in the last year. Prices of raw materials used in the production of automobiles have gone up about 45 points since March, 1922, while the general price index shows an increase of only 25 points in the same period. It should be explained, however, that the general index was about 18 points lower than the automotive at that time.

This fact in itself lends emphasis to the self restraint exercised by motor car makers in not making their products more expensive for purchasers.

To make the argument stronger, the automotive index has risen nearly 20 points since January 1, 1923, while the general index has remained practically stationary.

Not only are material costs considerably higher than they were a year ago, but wage rates also have risen. It speaks well for the efficiency of the industry, however, that labor efficiency has more than kept pace with wage rates and output per man is much larger than it was before the slump of 1920. Workers learned then what it meant to be out of a job, but they may show a tendency to get slovenly again, now that jobs are more plentiful than workers.

#### Huge Production Keeps Down Costs

Labor efficiency has tended to keep down costs, but the chief factor in this direction has been the huge production. The greater the output the lower the cost per unit. By raising his production to 6000 a day, for example, Ford will be able not only to fill orders he might lose by delay in delivery, but he is keeping down his costs per car and thereby offsetting in part higher material prices.

The assertion often is heard that people always buy more eagerly on a rising market. That may be true in the case of necessities when consumers have reason to think the price to them is going steadily higher. But what may be true of shoes or sugar is not necessarily true of motor cars.

If there were a famine of individual transportation in the United States, cost factors, within reason,

might have little influence on the market, but the sale of 5,000,000 new and used automobiles in the past year proves that there is nothing which approaches a famine. Most folks who never owned a motor car can get along without one for a while, and most of those who do own a car can drive it for a considerably longer period without actual suffering.

The psychology of the situation is different than it was prior to 1920. Prices had been going up for so long a period then that the great buying public had almost come to the conclusion that they never would come down. The people then decided to quit buying everything for a while and see what happened. They found that prices came down promptly. They have not forgotten that lesson and they know they are the real arbiters. They aren't even hoarding sugar on a rising market.

#### Reluctant to Raise Prices

The automotive industry may not be as stable as some of the older ones, but the men in it are pretty keen students of human nature and they usually can guess fairly accurately which way the public is going to jump.

That is one of the reasons they are so reluctant to hoist their prices unless actually forced to do so. They rather pride themselves, too, on never having been profiteers.

Accepting prices as of January 1, 1920, as 100 per cent, passenger car prices have shown an average decline of 26 per cent and there has been practically no change in the past fifteen months. According to price classes, the reduction shows 31 per cent under \$1,000; 6 per cent between \$1,000 and \$2,000, and 27 per cent for cars costing \$3,000 and more. Prices in the \$2,000-\$3,000 class are practically the same as they were at the beginning of 1920. There have been no material changes in any class since January of 1922.

The peak of prices in the same period by price class showed an increase of 20 per cent in July, 1920, for those costing less than \$1,000; 19 per cent in January, 1921, for those costing between \$1,000 and \$2,000; 14 per cent in September, 1920, for those between \$2,000 and \$3,000, and 7 per cent in September, 1920, for those costing \$3,000 and over.

As the situation stands today, automobile manufacturers have a slender margin of profit on their open models. Demand for cars of this type has not been as



large as it was expected to be when the present prices were made but, on the other hand, the demand for closed cars has been much stronger. There is a wider margin of profit on the closed models. As a consequence, they have been able to average their earnings and get by very creditably.

With the coming of warm weather, the call for open cars is likely to expand and for closed cars to contract. The result, obviously, will be smaller earnings, with a strong temptation to increase prices.

### Sales Contraction, But No Slump

We don't believe the bottom is going to drop out of sales with the coming of midsummer, although we do believe there will be a considerable contraction. We are convinced, however, that price advances would have a strong tendency to slow up sales almost immediately. The mere fact that the cost to the consumer hasn't gone up at a time when it seems almost inevitable that it will, is likely to lead many persons who have delayed buying to attach their names to the dotted lines so they will get their cars before they cost them more.

Notwithstanding the strong temptation to revise lists, and the real justification for doing it, especially in the case of open models, we believe that the ultimate earnings will be larger if a smaller profit per unit is accepted for the time being. If production costs continue to increase, higher retail prices for open cars will be inevitable, but if they can be deferred until early fall, when the demand for closed models again becomes insistent, the effect will be less serious.

By such an attitude of conservatism, the industry will benefit not only itself but the industry as a whole, which is showing a good many inflationary tendencies. Prices of commodities and finished products have been rising steadily for months and they will go still higher as the result of the recent epidemic of wage increases.

### Importance of Wage Increases Overemphasized

In a period of rising prices, wage increases are used as the excuse for inflation of values to a much greater extent than is justified by the added cost of production. It seems to be accepted generally, in industries other than the automotive, that a 10 per cent wage advance, for example, warrants an equal advance in selling prices, but this is not true.

It probably is a fact that profits are greater when wages and retail prices are advancing than they are when prices are down and labor's return is smaller. This undoubtedly is one of the reasons trade unions fight so vigorously to keep the pay of their members commensurate with the cost of the articles they buy. It also gives some justification for their contention that there is a good deal of "bunk" in the advocacy of lower wages as a pre-requisite for lower retail prices.

Trouble arises from impatient efforts to drive the industrial organization beyond its capacity. When the available labor supply is already fully employed a competitive struggle over it does not increase production. It simply forces up wages and production until they are checked by declining consumption. It is more difficult to send wages and prices down than it is to drive them up.

The industries of the country are already working practically at capacity or the limit of the labor supply. Under these conditions nothing tangible is to be gained by the use of further credit or greater productive capacity.

As the price situation stands today, motor vehicle manufacturers will be wise if they strive to increase labor efficiency and lower production costs by a higher average of efficiency rather than maintain their profits by higher prices to the purchaser. When plants are working at capacity nothing will be gained in the long run by entering a competitive struggle to increase their output by bidding against each other fruitlessly for labor and supplies.

A little breathing spell in the middle of the year won't be a bad thing for car manufacturers.

They must beware a huge accumulation of used cars with the coming of July unless dealers are a good deal wiser than they have been in the past. Any attempt to force sales with a big accumulation of used cars will be disastrous for the dealers.

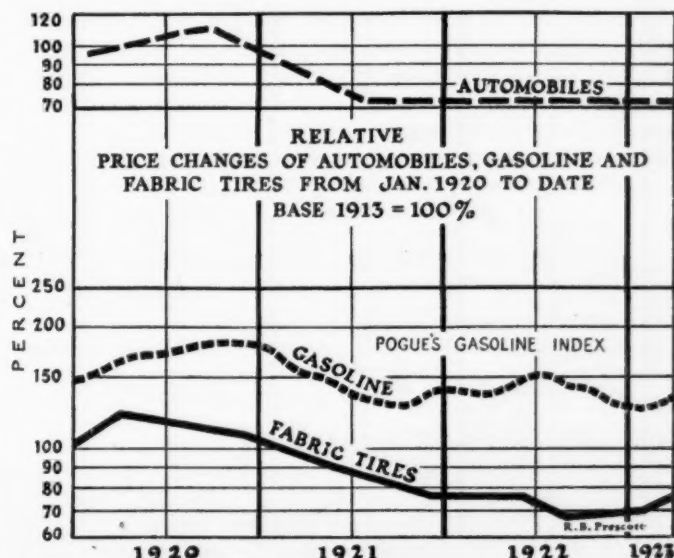
## Vital Interest in Rubber Prices Brings Automotive Organizations in Line to Combat Restrictions

Automobile manufacturers are not directly concerned with the making of tires, but they have a very vital interest in the prices of an essential part of the equipment for their products at a time when production costs are advancing rapidly.

For that reason there is a strong element of timeliness in the action by the directors of the National Automobile Chamber of Commerce in condemning the so-called Stevenson plan under which shipments of crude rubber by British producers are rigidly restricted. The purpose of the plan is to limit by legislation the exportation of rubber from the British possessions in the Far East.

After a thorough discussion of the situation, the directors strongly commended all persons and organizations who have combated the restriction plan and have sought measures of relief. The representatives of the motor vehicle manufacturers did not recommend any definite course of action and decided that no such recommendation would be possible until after a long and careful survey. They did voice strong approval, however, of Secretary Hoover's plan for investigation of the possibilities of providing American sources of supply in the Philippines and South America.

As the situation now stands, there is practically unanimous opposition to the Stevenson plan. Differences of opinion have arisen, nevertheless, over the best means of bringing about a modification. A majority of the



members of the Rubber Association of America feel that direct negotiation with British rubber producers will be the most satisfactory method. Harvey Firestone believes, on the other hand, that governmental agencies should be employed to remove what may be considered discrimination against American manufacturers. B. G. Work, president of the B. F. Goodrich Co., contends after a visit to England that conditions warrant application of restrictive measures.

The directors accepted the invitation of Hoover to appoint a committee of three to study sources of supply other than those now existing. This committee will be headed by J. Walter Drake, who is chairman of the foreign trade committee of the chamber.

### Fears Restriction Means Rubber Shortage

The fear of the N. A. C. C. is that the restrictive system, which is practically prohibitive in its operation, will create an arbitrary rubber shortage inasmuch as the law of supply and demand is not permitted to operate. It is granted without question that growers are entitled to a fair profit. Some of the directors feel that such a profit would be returned at a price of 25 cents a pound, while others think 30 cents would be none too much.

Under the Stevenson plan a full release of the British rubber crop is not possible until 36 cents a pound has been the London price for a full year. The agreement provides for the shipment of 60 per cent of the 1920 production of 335,000 tons, but the United States took 290,000 tons in 1922.

When the price in London is at the 30-cent level for three months, growers may ship an additional 5 per

cent. If it stays at that level for six months they can export 10 per cent more. If the price stays at 36 cents for three months they can ship another 10 per cent, and if it remains there six months they can send out 20 per cent more.

### Shipments Limited by Taxation

The Government does not prohibit the shipment of more than 60 per cent in so many words, but it does it with equal effect by a sliding scale of taxes. For the first 60 per cent there is a nominal export tax of 1½ cents a pound. If the exports of any grower exceed 60 per cent of his total, however, the tax becomes 7.94 cents a pound on every pound from the first to the last, and not on the excess alone. The tax runs as high as 23.85 cents a pound on shipments of 100 per cent of the grower's production.

If the London price falls below 24 cents growers are limited to exports of only 55 per cent of their crop.

Motor vehicle makers feel that high officials in Washington are entirely justified in their strong opposition to Government syndicates in foreign countries which control the prices and supply of such commodities as rubber, nitrates, coffee and sisal.

They agree with Secretary Hoover that there is no substantial reason why Great Britain should control the crude rubber supply when the lion's share of the output is consumed in this country. It is their belief that even though years must elapse before American plantations can begin to produce, they should be planted as soon as it is determined where they can be most advantageously located, so that American manufacturers can become independent of foreign producers.

## British Industry Inclines to Upward Trend

**T**HE outlook of the British manufacturer is improving. The unemployment question is less acute, more and more skilled workers being engaged every week.

Although in some quarters it is believed that there is a tendency to over-production in light car manufacture, a sound demand exists. Pre-Easter sales increased considerably, and it is anticipated that there will be many more buyers between now and the Whitsun vacation.

Pending the settling down of trade conditions in Ireland, large sales have been realized there, while exports to other countries, although small, indicate a general advance. Large car manufacturers report good business at the present time.

Manufacturers of sidecars are producing in greater

change in the tariff rates. Meanwhile, makers are in a position to give early deliveries on the receipt of orders. Encouraging inquiries are coming from Japan, while the domestic outlook is improved.

There have been severe cuts in motorcycle prices with a view to making machines more accessible to the poor classes. To a certain extent this object has been attained, lower prices having produced a greater demand from the colonies as well as from some Continental countries.

Official statistics just issued show that for the last two years British aircraft exports totaled above £3,000,000 in value. The figures follow:

	Airplanes (complete)		Engines and Parts		Airships and Parts	
	1921	1922	1921	1922	1921	1922
British Empire .....	£94,875	£144,240	£159,272	£167,074	£255	£4,806
Europe .....	143,399	270,021	123,992	219,316	2,680	4,702
Asia .....	813,058	248,021	275,656	205,054	27,100	1,154
Africa .....	.....	.....	.....	8,407	.....	.....
America .....	18,468	41,124	34,769	23,309	.....	333
Total .....	£1,069,800	£703,406	£593,689	£623,160	£30,035	£10,995

volume than last year, for stocks are thought to be low and an early boom is confidently expected. Motorcycle sales are fairly good, especially of the cheaper makes.

Improved demands are reported from India, but a disposition exists to withhold orders in anticipation of a

During the period under review 45 countries purchased 824 airplanes and 855 aero engines. The high Asiatic figures for 1921 are attributable to the fact that during that year Japan alone purchased from Great Britain 245 complete aircraft and 264 additional engines.



# Motor Car Death Rate Rises Less Rapidly Than Registrations

Casualty list of 14,000 in 1922 shows alarming increase, however. Equalled 12.9 per 100,000 of population. Grade crossing accidents not included in survey of underwriters. Two state investigations severely indict reckless drivers.

WHILE the number of fatal accidents caused by automobiles showed an alarming increase last year, the death rate based on the number of motor vehicles in use decreased materially. This is the only comfort which can be extracted by the automotive industry from a survey of highway casualties prepared by the automobile department of the National Bureau of Casualty and Surety Underwriters.

The toll in 1922 was 14,000 lives, an increase of 1600 over the total for the previous year. The death rate last year was 12.9 per hundred thousand of population as compared with 11.5 for the preceding year. While the number of motor vehicles in use has increased five fold since 1915, the number of fatalities has little more than doubled.

The estimate for 1922 was made on the basis of statistics supplied by the health officers of sixty cities with an aggregate population of 18,177,310. The cities in-

more stringent regulation of traffic, and the institution of safety campaigns throughout the country have all helped to pull down the ratio of automobile fatalities to automobiles in use, but despite the comforting indications of Figure 2, the fact remains that automobile

AUTOMOBILE DEATH RATE IN THE U. S.  
per  
10,000 AUTOMOBILES REGISTERED

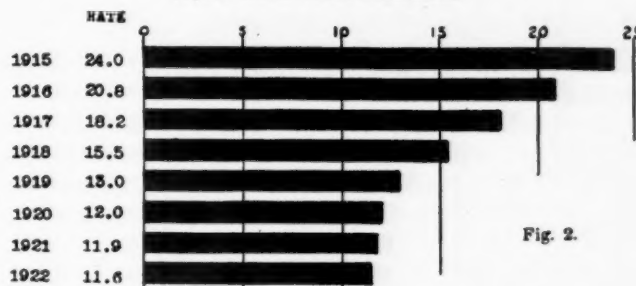


Fig. 2.

GROWTH IN NUMBER OF  
AUTOMOBILE FATALITIES  
in the  
UNITED STATES

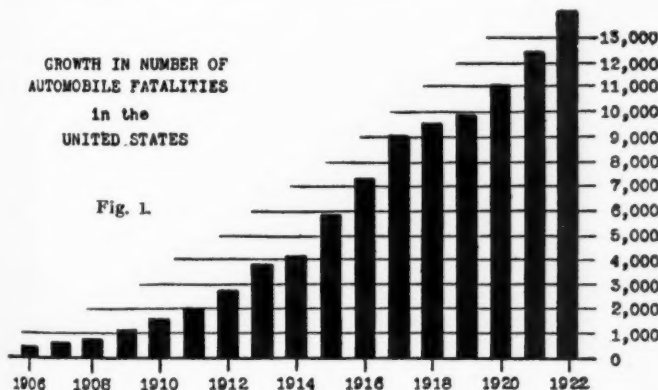


Fig. 1.

cluded in the study range in size from 25,000 population upward and are scattered over the entire country. It is assumed, therefore, that the indications for these cities are fairly representative of the whole nation.

The 1922 automobile death rate for these cities was 12 per cent higher than the 1921 death rate for the same cities. Application of this factor of increase to the 1921 country-wide death rate of 11.5 per hundred thousand population, produces a 1922 country-wide death rate of 12.9. This death rate multiplied into the population of the United States, estimated at 109,248,402, produces a total of 14,000 deaths.

Some idea of the trend in automobile deaths during the past seventeen years will be obtained from Figure 1. The number of deaths occurring each year has been calculated from the Bureau of the Census mortality statistics for the registration area. The remarkable growth in automobile accidents has been paralleled only by the growth of the automobile itself.

The education of motorist and pedestrian alike, the

fatalities are increasing in actual number at the rate of 1000 a year.

Figure 3 shows the distribution of all vehicular fatalities which occurred during 1922 in the sixty cities surveyed. The automobile was responsible for 67 per cent of all deaths caused by vehicles, more than four times the number caused by railroad trains, and seven times the deaths due to street railways. The "all other" classification in Figure 3 includes for the most part accidents caused by motorcycles, bicycles and horse-drawn vehicles.

## Grade-Crossing Fatalities Enormous

The foregoing totals of automobile fatalities do not include all the deaths for which the automobile may be held accountable. According to the accident classification system used by health officers throughout the country, deaths caused by collision between automobiles and heavier vehicles (such as railroad trains), are assigned to the heavier vehicles.

In the popular opinion, however, the automobile is charged with most grade crossing accidents. Failure on the part of many motorists to observe ordinary precautions at railroad crossings has resulted in a tremen-

DISTRIBUTION OF  
VEHICULAR FATALITIES  
in  
AMERICAN CITIES FOR 1922.

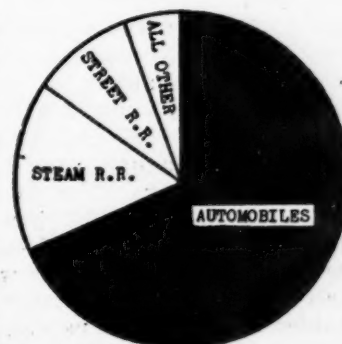


Fig. 3



dous loss of life year after year. The Interstate Commerce Commission's bulletins show the following automobile highway grade crossing casualties for 1919, 1920 and 1921:

Year	Killed	Injured
1919.....	1,232	3,558
1920.....	1,273	3,977
1921.....	1,262	4,025

Figures for the entire year 1922 are not yet available, but the statistics for the first nine months of the year indicate that the last year's totals will approximate 1300 killed and 4000 injured.

Analysis of 501 fatal accidents and 1000 non-fatal accidents which occurred in Massachusetts in 1922 showed the following:

Cause	Fatal	Non-fatal
Motorist at fault.....	347	826
Pedestrian at fault.....	121	134
Motorcyclist at fault....	18	24
Others at fault.....	35	38

In both fatal and non-fatal accidents, the leading cause of accident was given as "operating too fast for conditions." Speed caused 158 of the fatal accidents and 361 of the non-fatal accidents. "Inattention" was given as the second most prolific cause of accidents.

### Reckless Driving Chief Fault

The Wisconsin reports cover 1069 accidents which occurred between May 1, 1922, and January 1, 1923. The following is a tabulation of the causes of these accidents:

Cause	Number of Accidents
Reckless driving.....	631
Improper lights.....	61
Broken car mechanism.....	45
Intoxicated drivers.....	40
Weather conditions.....	46
Cars on wrong side of road.....	17
Narrow culverts and bridges.....	9
Miscellaneous .....	220

## Value of Soaring Flight Experiments Overestimated

**M.** SUFFRIN-HEBERT, professor at the French Aeronautical High School, concludes a long article on soaring machines or gliders in *La Technique Moderne* as follows:

Is it to be assumed that flight without motor can immediately be rendered practical and that we will soon see new soaring machines "evolutioning" in all directions? Certainly not, and for the following reasons:

First of all, with the present type of planes, with rigid wings and designed on the same principles as motor-propelled planes, it is necessary to carry on board special and very sensitive instruments, constantly indicating to the pilot the state of the wind, the arrival of a gust and that of a calm. With the aid of the indications of these instruments, assuming that they are given sufficiently promptly, the pilot may perform the necessary maneuvers, successive rises and dips. But in view of the fact that the frequency of the oscillations is considerable (in a 28-mile wind as many as 18 complete oscillations have been observed in five minutes), it is obvious that the pilot must give very close attention and keep constantly maneuvering if he does not want to lose the benefit of a considerable number of gusts.

It thus seems that horizontal flight by the present type of soaring planes is possible, but only at the price of a sort of continuous acrobatics, necessitating excessive dexterity and attention. It seems that the Germans have made some tests in this direction, and already have succeeded in keeping the air for a certain time in a horizontal wind. Nevertheless it is doubtful whether flight without engine has any kind of a future unless it is possible to replace maneuvering by the pilot by some sort of automatic mechanism, which, under the influence of the wind, would cause the plane to undergo such deformations as would enable it to utilize the power of that wind. It is this object that M. Dewoitine, and particularly Dr. Magnan, have been aiming to attain with their flexible wings. These wings, under the action of a gust of wind, assume of themselves the slight angle of incidence necessary for rising by taking advantage of the wind; during a calm the wings automatically resume their curvature and the large angle of incidence which enables the pilot to conserve, in part at least, the gain in altitude made during the period of wind.

This arrangement, however, is not sufficient in itself and should be completed by the automatic and synchronized displacement of the center of gravity. Other inventors are trying to achieve the same result by means of a special hinge connection of the wings to the fuselage. In any case, the practical working out of these arrangements is a delicate matter and will take time.

On the other hand, it must not be overlooked that the bird possesses an engine, the energy of its muscles; the sailing plane of the future also should be provided with an engine, of small power, it is true, which is necessary for starting and for making good any mistake in maneuvering or a momentary failure of the wind.

Finally, in view of the small loads per square foot of sailing planes, there is very little likelihood of their ever passing out of the class of sport and touring machines, the transportation of freight under these conditions leading to excessively cumbersome dimensions. It will thus be seen that true soaring flight, by the utilization of horizontal wind, is difficult to work out and that its practical utilization in the future will be very limited. This, however, is no reason for not carrying on its development in the most energetic manner. When soaring planes fly normally they may afford possibilities which cannot be foreseen at the present time.

### Large Demand for Service Equipment

**R**ETURNS from a questionnaire sent out by the automotive division of the U. S. Department of Commerce show that there is a demand for modern automotive service station equipment such as mechanical tire equipment, air compressors, etc., in almost every country where automobiles are sold.

Six hundred questionnaires were sent out several months ago to the U. S. Consular offices, asking the extent of mechanical tire equipment, used and if not used, whether there was a demand for it. To date sixty replies have been received, and with the possible exception of Mexico there seems to be a universal demand for mechanical tire equipment at all garages.

In the case of Mexico the majority of consular reports state that a hand pump appears to be the accepted method of tire inflation, although Mexican dealers are beginning to equip their garages with mechanical pumps.

# Main Bearing Bore Used as Locating Surface in Hinkley Crankcase

Several machining operations transferred to assembly department to assure correct alignment of pistons, cylinder flange and clutch. This method is said to save cost of some expensive fixtures which are ordinarily required in engine production.

**B**Y moving some operations out of the machine shop and into the assembly department the Hinkley Motors Co. is obtaining better results in alignment of parts which attach to the crankcase of the engines produced. Such operations as turning the bore of the bell-housing, finish milling of the surface to which the cylinder block is bolted and milling of the magneto bracket face are now done as the crankcase progresses along the assembly line.

This method secures better alignment and fit because it permits the work to be located from the bore of the main crankshaft bearings as a reference surface. This, in effect, makes the axis of the crankshaft the line from which are located the various surfaces which must be machined parallel or at right angles to the crankshaft. Thus their correct relative position is assured. This, in turn, makes it easier to align properly the cylinder bores and thus reduces the difficulties incident to fitting the pistons correctly in the cylinders.

Using the crankshaft axis as the line of reference also insures correct machining of the bellhousing and consequent exact alignment of the clutch, thereby preventing cocking of the plates and giving them a full and equal bearing around the entire clutch periphery. This method of location for machining cannot be used until the finished bearings are in place.

At the beginning of the final assembly there is a machine for finish tapping the cylinder stud holes and another machine for drilling the crankcase for the pins which hold the cylinder studs in place. By having these machines here no serious locating problems are presented, and costly fixtures in the manufacturing department are dispensed with.

The first operation on the crankcase after it enters the assembly department, is to insert the main bearings and put on the caps. In assembling the bearings, which are of the bronze-backed, babbitt-lined type, the bearing must be driven into the crankcase because the outside diameter of the bronze shell is about .008 in. oversize. Driving the half bearings into the crankcase closes them to some extent and puts them out-of-round, a condition which is corrected in subsequent operations.

## Fitting Bearing in Cast Iron Cap

This method of fitting is used to secure a positive seat of the bronze shell against the iron case. The same method is employed in fitting the other half of the bearing in the cast iron cap. A special machine which seats a complete set of three bearings in these caps at a time is utilized. The operator taps lightly on the back of the half bearing to spring the metal out before it is driven into the cast iron cap, with the result that it is a very firm fit in the cap after assembly.

After the half bearings are seated in the iron caps, screw holes are drilled through the bearings and these holes are counterbored to form seats for the screws which hold the bearing in place in the cap. The bearing is then taken out and the screw holes in the iron cap are counterbored with a light cut in order to make it certain that the screws will positively draw the bronze against the iron cap. The same operations are performed on the other half of the bearing to secure a good seat in the crankcase.

Shims are then dropped on the bearings and the bearing caps are assembled in place. The shims employed are the type with the babbitt inset manufactured by the Laminated Shim Co. This babbitt inset closes the longitudinal oil passage along the bearing split and acts as a non-scoring feature.

## Bearing Surface Faced in Special Fixture

With the bearings in place, the crankshaft, camshaft and idler gear bearings are bored horizontally in a single special fixture. A rough reaming cut is taken and the finish bearing surface is provided by a fly cutting operation using a Kelly reamer bar. This same fixture is also arranged to face the water pump flange, thereby insuring alignment with the gear train and the crankshaft centerline. By doing this work all in one fixture, parallelism of the crankshaft, camshaft and idler bearings is assured.

With the centerline of the crankshaft established, an arbor is put through the crankshaft bearings and the crankcase is put in a fixture for milling the top face upon which the bottom flange of the cylinder block rests. The location for this work is secured by having the arbor through the main bearings rest in a V-block and a plug, on the fixture, which goes into the front camshaft bearing. A very light milling cut is then taken on the face which bolts to the cylinder block flange, to insure the alignment of this face with the center line of the crankshaft. This work is performed on a Cincinnati miller.

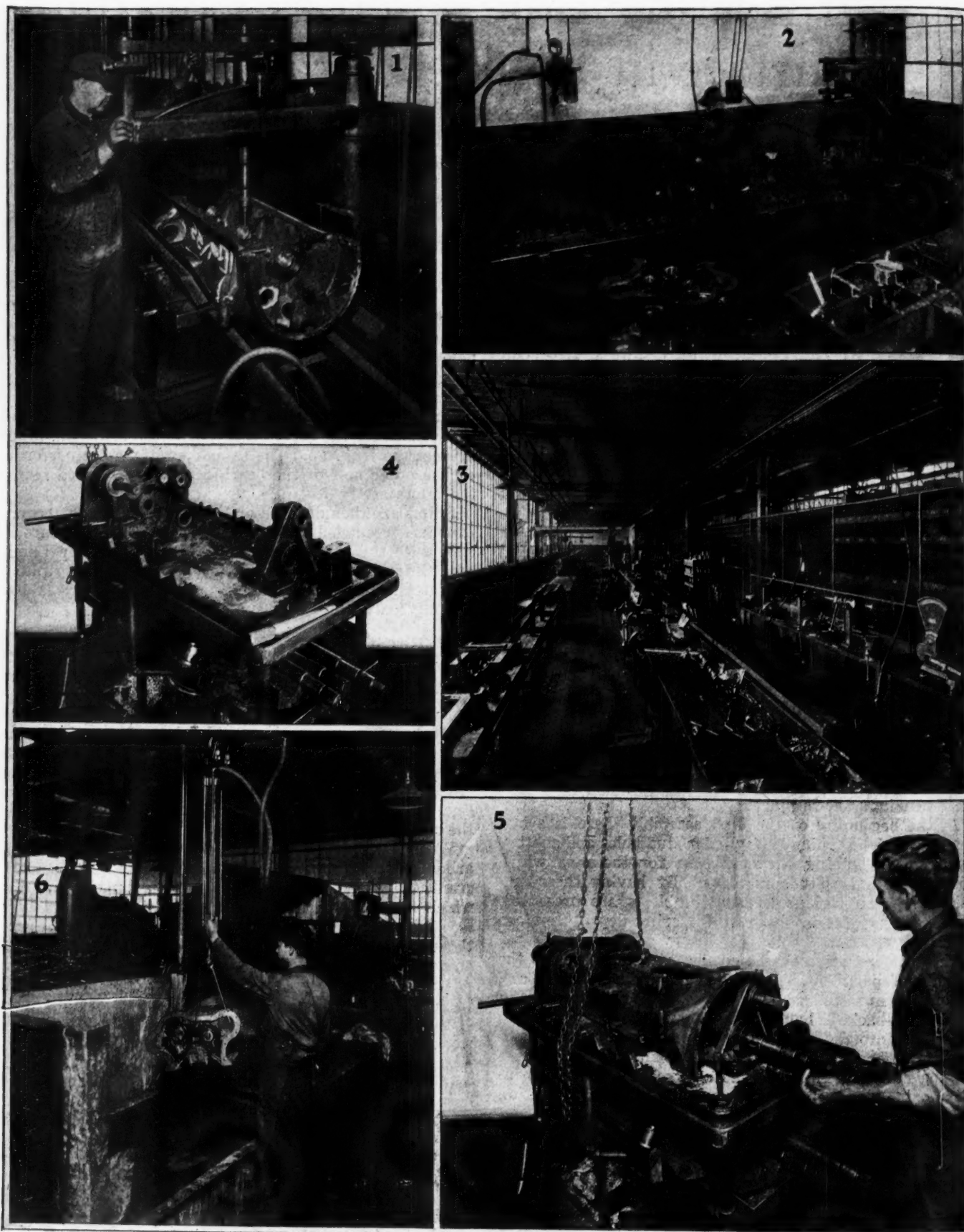
A similar operation is performed on a LaBlond miller, using exactly the same set up and the same method of location with the exception that the plug on the fixture pilots into the water pump pilot hole instead of in the front camshaft bearing hole. This milling machine takes a light cut off the magneto pad and insures the alignment of this pad with the gear train, as well as with the center line of the crankshaft.

The water pump pilot hole is again utilized as a locating means in drilling the magneto pad, a fixture being employed which has a plug at one end fitting into this hole and resting on the magneto pad at the other end. This fixture carries the locating holes for the magneto pad.

After some other miscellaneous drilling operations are performed, the pan is put on the crankcase and held by



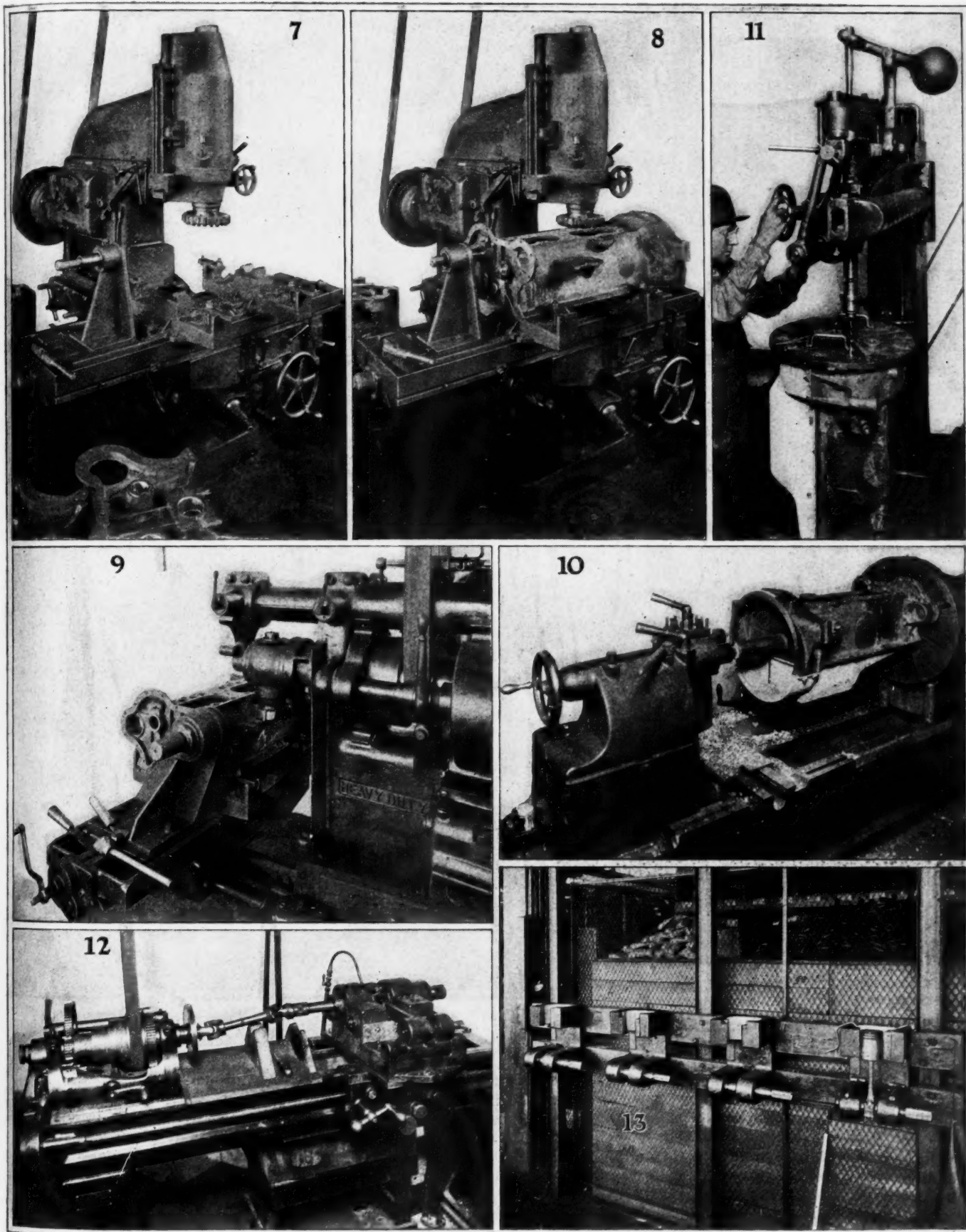
## Hinkley Engine Assembly Line and Drilling Operations



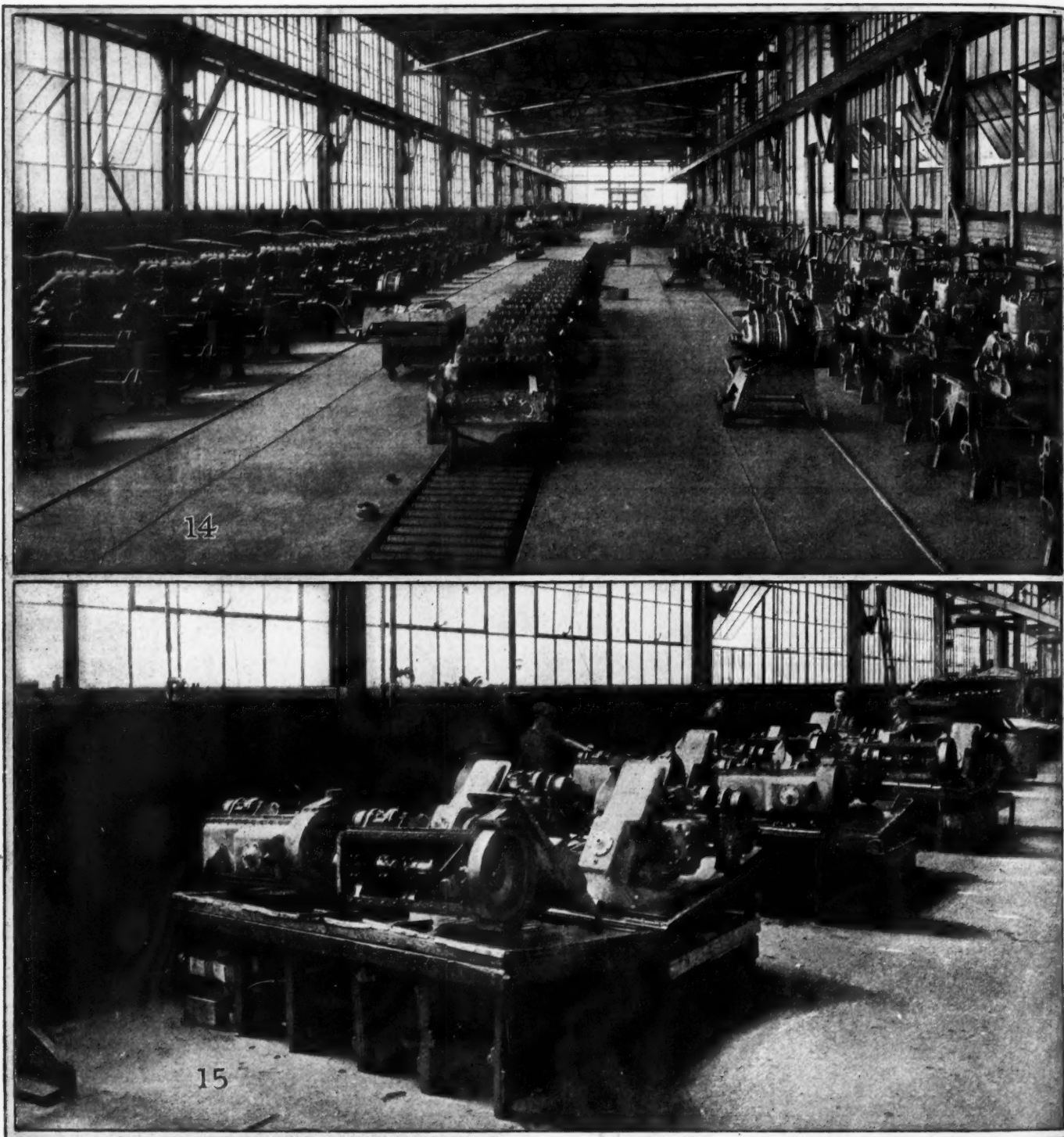
1—Radial drill mounted directly over assembly line for drilling main bearings. 2—Drilling operations directly on assembly line. One man handles these three operations. At the left is a finish taper for the cylinder studs; center, an air wrench for driving studs and at the right a drill for drilling stud flanges for the stud retaining pin. 3—Assembly line layout illustrated. 4—Horizontal fixture used for piloting the Kelly reamers for the main, camshaft and idler bearings, also for facing the water pump flange. 5—Bearing, reaming and fly cutting operation on horizontal jig. 6—Applying sealing compound



## Milling Operations in Hinkley Engine Production



7—Jig for positioning milling operation on cylinder contact face by arbor through crankshaft bearings. 8—Milling cylinder contact face. 9—Milling the magneto pad. 10—Turning and boring bell housing. 11—Plate type of jig with bolt circle for three sizes of bell housing. 12—Power drive and feed for reaming connecting rod bearings. 13—Straightening jig for four sizes of piston and connecting rods



14—Engine test room. Each engine receives an 8 hr. rough run and 2 hr. finish run. 15—Roll-over stand upon which engines are torn down, inspected and rebuilt between rough and finish test runs

four bolts and dowels for exact location. The entire assembly is then mounted on an arbor through the crankshaft bearings. With this arbor as a locating means the bell housing bore and face is turned, thus insuring alignment with the crankshaft. This operation is a step to secure accuracy of the clutch assembly. The work is performed on a large Monarch engine lathe. Several of the fixtures in the Hinkley shop are designed to be used for more than one model of engine. The fixture used for drilling the holes in the bell housing can be used for three models, to provide either a number 1, 2 or 3 bell housing. This fixture is a plate type mounted on the end of the bell housing.

The assemblies are then dipped in an Oakite solution and sprayed with crankcase sealer. In connection with this operation, a very interesting hoist is employed. It was manufactured in the Hinkley plant and is distinguished by being both very cheap and very effective. It is an air hoist and is manufactured by simply cutting off a piece of seamless steel tubing, closing it at the top end and fitting a piston attached to the hoisting hook rod with a two-way air cock below the piston. The rod carrying the hoisting hook passes through a stuffing box at the bottom. Turning the cock one way admits air under the piston, providing a lift, and turning it the other way exhausts the air, allowing the part to drop



by gravity. There are no machining operations whatever, on the tube, this simply being fitted with a piston having leather buckets. It is of exceedingly inexpensive construction.

### Sub-Assemblies Adjacent to Conveyor

The crankcases are started down a roller conveyor line under machines for finish tapping the cylinder stud holes, driving the studs and for drilling and pinning the stud flanges and locking them into the case. The sub-assemblies are added to the crankcase as it passes along this conveyor line. The first of the sub-assemblies to be put in place is the oil pipe line. The sub-assemblies are put together adjacent to the main assembly line so that they are available at the proper point along the conveyor. The connecting rods are hung on the crankshaft and after they are fitted, this releases the crankshaft for assembly. The connecting rods are marked with a number corresponding to the number of the crankshaft and are passed along to the point where the pistons are fitted.

The pistons are selectively assembled by weight to the connecting rods and all are given a balance inspection on scales in the usual manner. The assembled pistons, connecting rods, piston pins and rings meet the engine assembly again after the crankcase has been fitted to the block. At the time the piston assembly reaches the conveyor the engine is inverted so as to permit ready assembly of the pistons to the block through the bottom of the case. In fitting the connecting rod bearings the clearances will vary from .00125 to .0015 in. The connecting rod bearings are reamed to within .001 in. by power feed, this having proved to be more uniform than hand feed. Just enough hand scraping work is done in the case of these bearings to make sure that there is a proper fillet on the ends of the bearing.

An interesting fixture is used for checking the alignment of the pistons and connecting rods. An arbor is passed through the lower connecting rod bearing and the piston must pass accurately between two surfaces which correspond to the walls of the cylinder. The space behind these two surfaces is painted white so as to

permit easy sighting through the aperture between the dummy cylinder wall and the pistons for accuracy and alignment. There are four sizes of these alignment jigs to take care of all four of the models made by the Hinkley company.

Another interesting point in the piston assembly department is a sort of box arrangement with handles which is put over the piston and acts as a driver for the hand reaming of the piston pin. This provides the operator with the proper leverage for operating the hand reamer and, at the same time, being of wood, cannot damage the pistons.

The usual operations of putting on manifolds, spark plugs and the various engine parts are performed along the conveyor line and the engine leaves the end of this to go directly to the block test department. Here the engines are put at once under their own power and given an 8 to 10 hr. rough run. They are put at about one-quarter throttle opening for 2 hr., one-half throttle opening for 2 hr., and wide open throttle for the remaining 4 hr. They are under a load which corresponds to about 30 hp. at 1,000 r.p.m. The load consists of a fan dynamometer with the paddles outside the building wall.

### Engines Torn Down After Rough Run

After the rough run, the engines are all torn down and the pistons, bearings and bores thoroughly inspected and corrected, if necessary. The engines are then re-assembled and put on the block for a 2 hr. final check run under full load. Every engine receives this treatment. It requires about 2 hr. for a man to perform the roll-over or tear down and rebuild operation between the rough run and the finish run.

When the engines have satisfactorily passed through the finish run, they are dipped in an alkali bath, rinsed in clear hot water, sprayed, passed through an automatic oven and sprayed again. They then again pass through the automatic oven and are ready for boxing and shipping. It requires about 40 min. for the engines to pass through the baking oven. This is held at constant temperature, automatically controlled. About 400 deg. Fahr. is the usual temperature employed.

## Propeller Shaft Torque Reaction Usually Neglected in Design

ACCORDING to a note by M. Petot, recently presented to the French Academy of Sciences, one of the reactions in an automobile which is usually neglected by the designer is that caused by the propeller shaft torque.

Petot says that we provide a torque arm or its equivalent to take care of the reaction to the rear axle torque, which tends to turn the axle housing in a direction opposite to the rotation of the wheel, but no provision of any kind is ever made to take up the propeller shaft torque reaction, which usually amounts to about one-fourth of the former. The ratio between the two is, of course, substantially that of the ratio of the rear drive, which is here supposed to be of the bevel gear type.

The bevel pinion shaft is mounted in bearings in the rear axle housing, and owing to the pressure of the teeth of the pinion on those of the gear, the axle housing tends to turn around the pinion axis. It is pointed out in the paper that whenever the clutch is operated, the gear changed or the transmission brake applied, this torque reaction passes from one value to another, and the question of the stability of the vehicle arises. The immediate re-

sult of any change in the propeller shaft torque due to any of these causes is that the reaction of the two rear wheels on the ground is momentarily changed, that on one side being increased and that on the other decreased. The effect lasts only for an instant, until the rear body springs begin to act. This change in ground reaction is of some importance inasmuch as the adherence of the wheels to the ground changes simultaneously.

The change in the rear axle torque, caused either by the operation of the clutch or a change of gear, is of no great importance, because the torque always remains in the same direction. The stability of the vehicle is not appreciably affected, provided, in going from the high to the low gear, a pause is made at the intermediate gears.

The conditions are entirely different when the transmission brake is applied. The torque on the propeller shaft is then reversed and the up-setting couple on the rear axle housing is proportional to the sum of the driving and braking torques. This fact is advanced as an argument against the use of transmission brakes, and it is said to have also a bearing on the value of four wheel brakes.



# Analysis of Car Sales in **NEW YORK**

Shows Expensive Models Popular

## Percentage Gain of Registrations in

**NEW YORK**  
has been

1½ times as great as the percentage gain in number of dealers since 1917

41 times as great as the percentage gain in population since 1915

83/100 as great as the percentage gain in United States registrations since 1915

**S**PECIFIC data are needed about each sales territory if intelligent analysis of markets is to be made and if dealer quotas are to be properly fixed.

These data must be correlated over a period of years, so that past trends can be used to predict future probabilities in a general way.

The accompanying article gives a detailed survey of registration and dealer trends in the State of New York. It will provide valuable material for use in market studies and in making merchandising plans. Analysis of other States will appear later.

**R**EGISTRATIONS in New York are still climbing rapidly, although the rate of growth has begun to lag a little behind that of the United States as a whole. High priced cars find a particularly ready market in the Empire State.

Since 1915, New York registrations have increased .83 as fast as registrations for the entire country. There is every indication, however, that they will continue to grow more rapidly than population for seven or eight years to come—perhaps a little longer.

This means that New York dealers properly may be expected to accept a somewhat larger quota each year. The additional number of cars allotted to each one should be based upon the rate of growth of registrations shown in Fig. 1. The figure so determined will have varied in conjunction with current business conditions.

The number of dealers in New York has increased proportionately almost as fast as registrations since 1917. Percentage increase in registrations has been 1½ times as great as percentage increase in number of dealers.

But percentage registration gain has been 41 times as great as percentage population gain since 1915. Comparison of the New York registration curve with the New York population curve in Fig. 1 shows that the rate of registration and population increase will not be the same for some time to come. Within ten years, however, the registration curve will be straightening out. When it does become analogous to the population curve the period of stability will have been reached.

### New York Leads in High Priced Cars

Sales in the state from that time forward will consist of replacements of cars that have gone out of use and of new cars needed by the increased population. The sales for any given period will depend upon current economic fluctuations.

Middle-priced and high-priced cars have attained more popularity in New York than in the country as a whole. Fig. 2 shows the distribution of cars in New York State by price classes since 1914.

Cars selling for less than \$1000 reached their peak in 1915, when they comprised 65 per cent of the total state registration. Since 1914 the percentage of "Under \$1000" cars has ranged between 45 per cent and 65 per cent of

the State total, as against a 52 per cent minimum and a 72 per cent maximum for the United States.

The relatively small proportion of low-priced cars in New York results, of course, in a greater proportion of high-priced vehicles. The close relation of the "\$2000-\$3000" curve to the "Over \$3000" is specially interesting, since the former usually runs well above the latter so far as percentage of total registration is concerned. For New York, however, these curves cross each other at three points.

The relative importance of high-priced cars in New York as compared with the whole country is clearly illustrated by the 1921 figures, which show that:

Eight per cent of New York registration was in the "Over \$3000" class, while

Three per cent of United States registration was in the "Over \$3000" class.

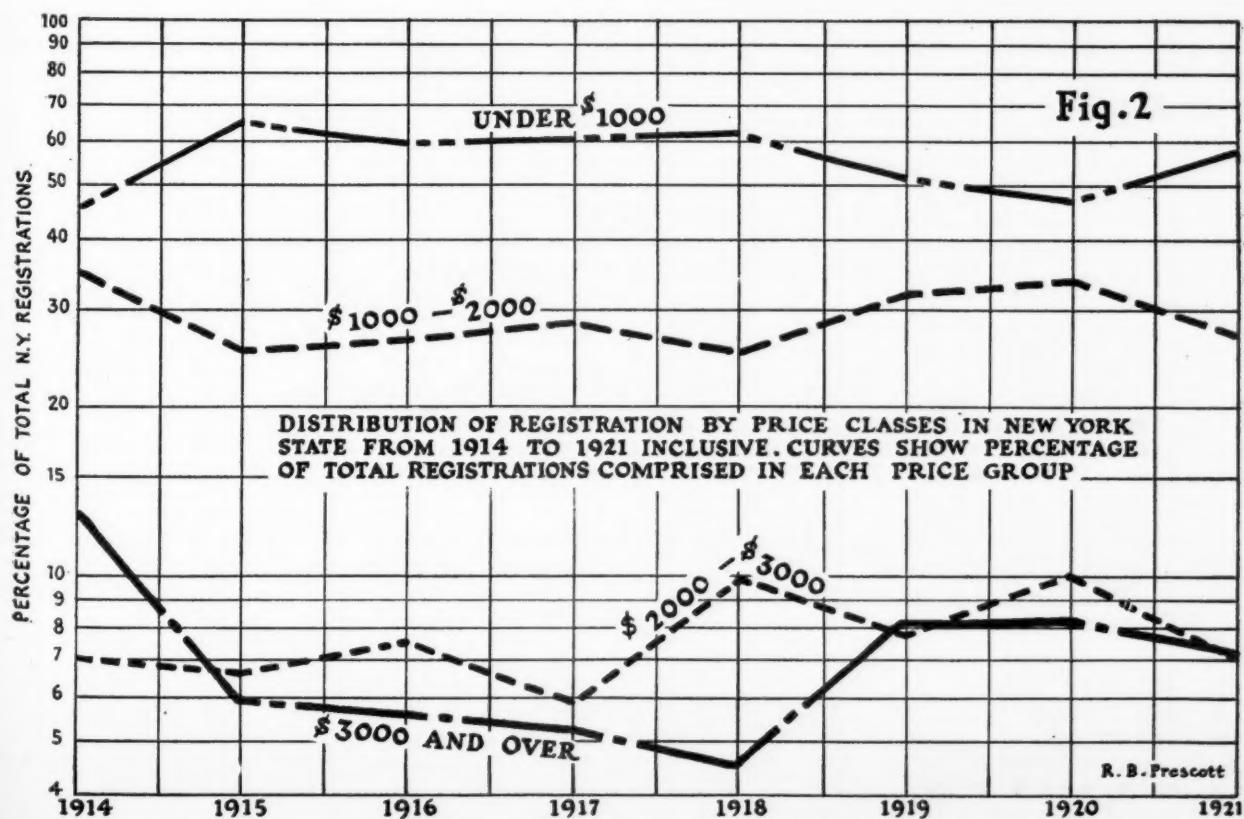
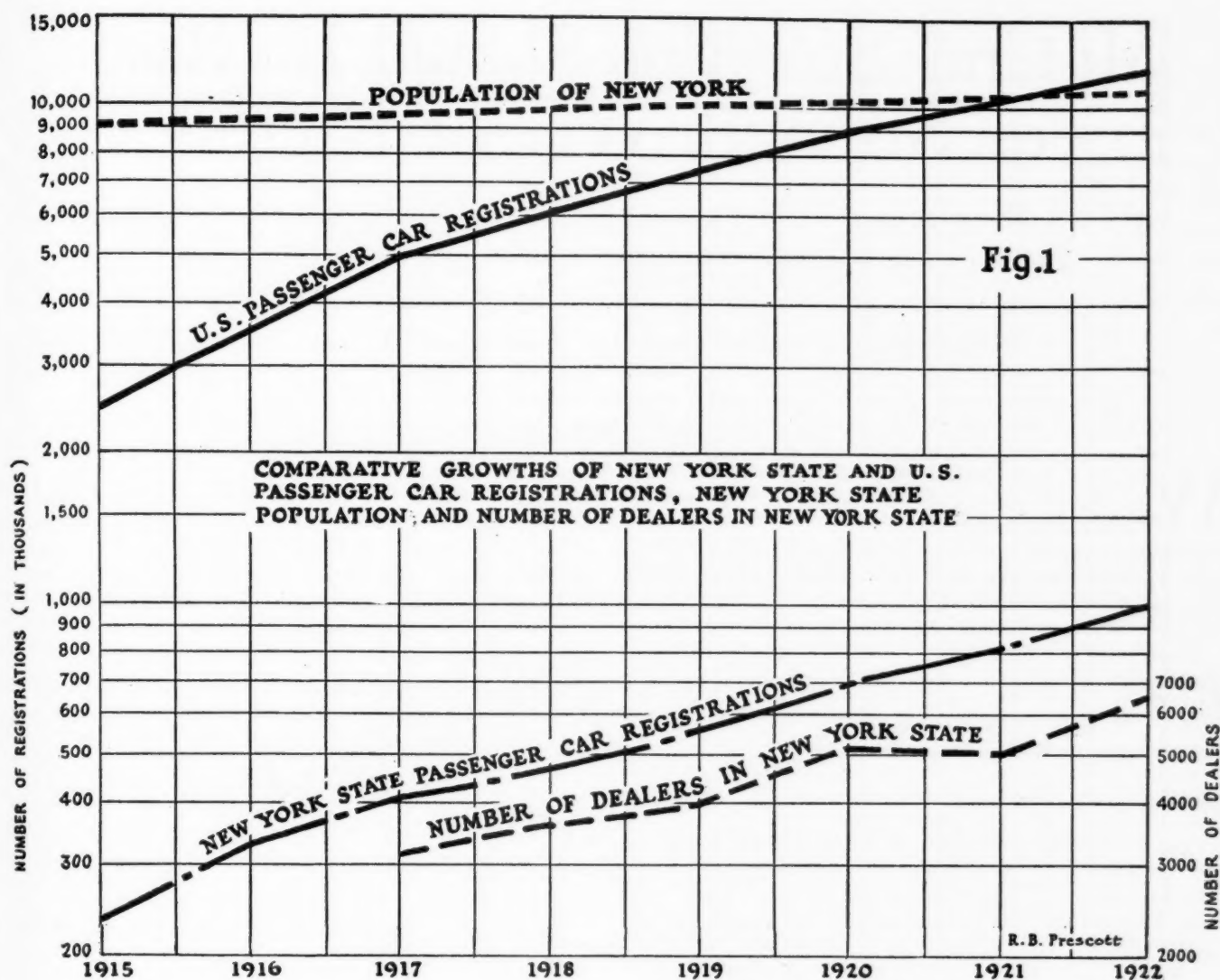
Figures of this kind throw a new light on the character of various markets and have a strong bearing on methods of setting sales quotas.

Density of population in New York has increased from 195 people per square mile in 1915 to 226 people per square mile in 1922. The number of cars per square mile has increased from 5 to 21 during the same period. This shows the population gain per square mile to have been 16 per cent as against 320 per cent for car registrations.

The relatively faster increase of registrations has reduced the number of persons per car in New York from 42 in 1915 to 10.6 in 1922.

The number of cars has increased relatively more rapidly than the number of dealers. In 1917 there were 128 cars for every dealer in the State; in 1922 there were 156.

Car registrations may not continue to grow more rapidly than the number of dealers. It is possible that sharper competition will make sales more difficult with the result that more dealers will be needed to sell a given number of cars. This tendency is offset to some extent, of course, by the increasing density of population which brings a greater number of prospects within easy selling distance of each dealer establishment. In many cases, however, the greater density of population has already developed acute traffic problems which act as sales resistants.



# Material Selection Should Be Based on Strength-Weight Factors

These properties are interdependent and their consideration makes possible both direct and indirect economies. Decrease in vehicle gross weight would permit large savings. Tensile strength-specific gravity ratio a good guide for purchasing.

By Horace C. Knerr

Chief Metallurgist, Naval Aircraft Factory

WE are accustomed to think of weight and strength as two fundamental, but quite different and unrelated, properties of matter. We think of some materials as strong, such as steel or oak, and others as light, such as aluminum and cork. If we find a material which is both light and strong, such as duralumin, we regard it as a fortunate combination of circumstances.

But, in the construction of aircraft, we learn that a material is "light" only if a member made of it, and possessing the required strength, comes within a given allowance for weight; or it may be considered strong only if a member of a limited weight possesses the required strength. In other words, the strength and weight of a material cannot be considered independently, but must always be considered in combination.

It is evident that, not only for machines which fly, but also for any structure which must support itself, be supported or be moved under power, the strength and weight of structural materials must be regarded as interdependent (and opposing) properties. It is the strength-for-a-given weight, or the weight-for-a-given-strength that is important, not merely the strength or weight.

The merit of one material as compared to others on the basis of strength-and-weight might be called its "strength-weight efficiency." A simple and convenient means for expressing the strength-weight efficiency of a

material and comparing it with other materials is the number obtained by dividing the ultimate strength, in thousands of pounds per square inch, by the unit weight, or specific gravity. This number may be called its *strength-weight factor*.

A simple example will serve to illustrate the use of strength-weight factors in comparing materials. Suppose it is desired to know the relative merits as regards strength and lightness of steel, aluminum and spruce wood, assuming that any one of them could be used in a given tension member:

	Tensile Strength, lb./sq. in.	Specific Gravity	Strength-Weight Factor
Steel, mild . . . . .	60,000	7.85	$\frac{60,000}{7.85 \times 1000} = 7.65$
Aluminum, soft . . . . .	12,000	2.73	$\frac{12,000}{2.73 \times 1000} = 4.38$
Spruce . . . . .	10,000	0.43	$\frac{10,000}{0.43 \times 1000} = 23.2$

The materials may be compared directly on the basis of their strength-weight factors, which show that the spruce is about three times as good as the steel, and that the latter is about 1.75 times as good as the aluminum. Aluminum evidently would be a "heavier" metal than steel for this purpose. Reduced to its simplest terms, this means

TABLE 1  
METALS, ROLLED, FORGED OR DRAWN

$$\text{Strength-Weight Factor} = \frac{\text{Tensile Strength, lb. per sq. in.}}{1000 \times \text{Specific Gravity}}$$

(Arranged in the order of strength-weight factors)

Material	Ultimate Tensile Strength	Weight, Lb. per Cu. Ft.	Specific Gravity	Strength-Weight Factor	Material	Ultimate Tensile Strength	Weight, Lb. per Cu. Ft.	Specific Gravity	Strength-Weight Factor
Music wire, 0.011" dia. . . . .	400,000	490	7.85	51.0	Magnesium, hard drawn . . . . .	33,000	109	1.75	18.8
Music wire, 0.081" dia. . . . .	310,000	490	7.85	39.5	Alloy steel (medium) . . . . .	125,000	490	7.85	15.9
Aircraft wire, 0.081" dia. (No. 12) (1.744 lb./100 ft.) (1300 lb. break) . . . . .	252,000	490	7.85	32.1	Elektron rolled (Mg. 90, Al. 10) . . . . .	27,000	112	1.80	15.0
Alloy steel (very high) . . . . .	200,000	490	7.85	25.4	Carbon steel, heat treated . . . . .	100,000	490	7.85	12.7
Duralumin, hard rolled . . . . .	67,000	178	2.85	23.5	Aluminum, hard rolled . . . . .	22,000	170	2.73	8.15
Duralumin, wire drawn . . . . .	60,000	178	2.85	21.0	Mild steel (structural) . . . . .	60,000	490	7.85	7.65
Duralumin, heat treated . . . . .	55,000	178	2.85	19.3	Aluminum, half hard . . . . .	18,000	170	2.73	6.66
Alloy steel (high) . . . . .	150,000	490	7.85	19.1	Soft iron . . . . .	40,000	490	7.85	5.10
					Aluminum, full annealed . . . . .	12,000	170	2.7	4.44
					Copper, soft . . . . .	30,000	550	8.9	3.38



TABLE 1A  
CORROSION RESISTING METALS  
ROLLED, FORGED, DRAWN

Material	Ultimate Tensile Strength	Weight, Lb. per Cu. Ft.	Specific Gravity	Strength-Weight Factor
Stainless steel.....	150,000*	500	8.0*	18.7
Pure nickel (99%) cold rolled.....	150,000 (Max.)	553	8.87	16.9
Cyclops No. 17 as rolled .....	135,000	500	8.0	16.9
"Rezistal" sheet, Grade 4, as rolled.	125,000	485	7.76	16.1
"Rezistal" sheet, Grade 4, annealed	100,000	485	7.76	12.8
Cyclops No. 17 annealed .....	100,000	500	8.0	12.5
Phosphor bronze....	100,000	555	8.9	11.2
Pure nickel (99%) hot rolled.....	85,000	553	8.87	9.57
Monel metal, rolled.	80,000	555	8.9	9.0
Brass sheet and bar, rolled .....	55,000	525	8.4	6.5
Copper sheet, hard..	40,000	555	8.9	4.5
Zinc sheet.....	27,000	444	7.1	3.8

Note: Strength values, tension, pounds per square inch, minimum.  
Weight and specific gravity, maximum.

\*Approximate.

that if all the members were of equal weight per foot of length, they would support tensile loads in proportion to their strength-weight factors. Or, if the loads were made the same, the weight of the members would be inversely proportional to their strength-weight factors.

The use of the strength-weight factor permits direct comparison without the necessity for figuring actual sectional area, weight or load of members which are in simple tension or compression.

The strength-weight factors of a number of useful materials are given in the accompanying tables. For simplicity, the materials have been grouped into classes, as follows: Table 1, rolled, forged, or drawn metals; Table 2, cast metals; Table 3, wood; Table 4, rope, cable, thread, cord, etc.; Table 5, fabric, paper, etc.; Table 6, miscellaneous.

In the majority of cases, materials from the different classes represented in the tables are not interchangeable, for various reasons. All of the materials may, neverthe-

less, be compared upon the basis of their strength-weight factors, given in the right hand column. For example:

Linen thread and fine steel music wire have the highest value of all the materials listed, and are practically equal, both having a strength-weight factor of 51. Good silk thread and cord is next, with a strength-weight factor of 40 to 45. White ash, in tension, is comparable with alloy steel of 200,000 psi. (pounds per square inch) tensile strength, with a strength-weight factor of 25. Die cast, heat treated "Lynite 195D" (SWF 14.5) is higher on the strength-weight scale than steel of 100,000 psi. tensile strength (SWF 12.7).

The strength-weight tables show that heat treated duralumin is the equivalent of alloy steel of slightly over 150,000 psi. tensile strength (SWF 19). The magnesium-aluminum alloy, "elektron" (SWF 15), which has sometimes been rated superior to duralumin on account of its low unit weight, is seen to be inferior to that alloy, although nearly equal to alloy steel of 125,000 psi. ultimate strength (SWF 15.9). Some of the corrosion-resisting alloys have remarkably good values, stainless steel heading the list with a factor of 18.7.

Among the castings, the heat treated die casting alloy Lynite 195D is distinctly the leader (SWF 14.5); with a high-grade manganese-bronze, second (SWF 11.3); and cast steel (SWF 11), third. There is close competition for fourth place between Lynite 195S (a sand cast, heat-treated aluminum alloy), and cast Rezistal (a "heavy" rust resisting alloy). Manganese-bronze, steel, and Rezistal have the highest ductility, but cannot compete with the light-metal alloys in small parts where the thinness of wall for the heavy metals would be prohibitive.

Internal defects have a greater influence in castings of heavy metals, where the unit stresses are high, than in castings of light alloys of equal weight where they represent a smaller proportion of the cross section.

The well-known commercial aluminum alloys SAE No. 30 and No. 31 show a fairly good rating on the strength-weight scale, the former being more than twice, and the latter three times as good as cast iron.

Except in the table of woods, all strength-weight factors have been based on tensile strength. The strength of metals in compression is generally about the same as in tension, or higher. This is not the case with woods, however, and on account of the great difference between the tensile and compressive strength of most woods, both values have been given, where available.

TABLE 2  
CAST METALS

Material	Ultimate Tensile Strength	Weight, Lb. per Cu. Ft.	Specific Gravity	Strength- Weight Factor	Material	Ultimate Tensile Strength	Weight, Lb. per Cu. Ft.	Specific Gravity	Strength- Weight Factor
Die-cast lynite No. 195D .....	40,000	172	2.77	14.5	Manganese bronze..	65,000	550	8.8	7.40
Manganese bronze (special) steel....	100,000	550	8.8	11.35	Monel metal.....	65,000	555	8.87	7.33
Steel .....	85,000	480	7.7*	11.00	Magnalium (Mg. 2, Al. 98).....	18,000	169	2.7	6.65
Sand-cast lynite No. 195S .....	29,000	172	2.77	10.5	Aluminum alloy (S. A. E. No. 30) (Cu. 7-8.5).....	18,000	178	2.86	6.30
"Rezistal" (cast)—Grade 4.....	80,000*	482	7.7	10.4	Malleable iron....	45,000	450	7.2*	6.24
Elektron (Mg. 90, Al 10).....	18,000	112	1.8	10.00	Phosphor bronze... 45,000	550	8.8	5.12	
Silumin, alpax, etc. (Si, Al, modified)	25,000	163	2.6	9.60	Brass (Cu. 70, Zn. 30) .....	40,000	524	8.4	4.77
Aluminum bronze (Cu. 90, Al 10) ..	80,000	530	8.5*	9.43	Pure aluminum....	12,000	170	2.7	4.45
Aluminum alloy (S. A. E. No. 31) (Zn. 15, Cu. 3)...	25,000	187	3.0	8.33	Bronze (Cu. 80, Sn. 20) .....	22,000	543	8.7	3.68
Lynite 145S .....	23,500	181	2.9	8.10	Gun metal (88, 10, 2)	30,000	550	8.8	3.41
					Naval brass (Cu. 62, Sn. 1, Zn. 37).....	25,000	520	8.3	3.01
					Iron, gray.....	20,000	443	7.1	2.82
					*Approximate.				

\*Approximate.

TABLE 3  
WOOD

(Arranged in Order of Merit for Compression)

Material	Ultimate Strength (Parallel to Grain)		Weight, Lb. Per Cu. Ft.	Specific Gravity	Strength- Weight Factor.		Order of Merit- Tension
	Tension	Compression			Tension	Compression	
Balsa .....	(?)	2,200	7.5	.12	....	18.3	(?)
Douglas fir .....	11,000	6,000	34	.54	20.4	11.1	6
Cedar, western red.....	(?)	4,000	23	.37	....	10.8	(?)
Cedar .....	10,500	5,300	31	.50	21.0	10.6	5
Spruce .....	10,000	4,300	27	.43	23.2	10.0	2
Walnut, black.....	8,000 (T)	6,100	38	.61	13.1	10.0	13
Pine, white.....	8,000	4,500	29	.46	17.4	9.8	8
Maple, hard .....	10,000 (T)	6,500	42	.67	14.9	9.7	10
Mahogany (true).....	13,000	5,500	36	.58	22.4	9.5	3
Birch .....	15,000 (T)	6,600	43	.69	21.7	9.5	4
Ash, white .....	16,000 (T)	6,000	40	.64	25.0	9.4	1
Poplar, yellow .....	7,000 (T)	4,100	28	.45	15.5	9.1	9
Hickory .....	11,000 (T)	7,300	50	.80	13.7	9.1	12
Pine, long leaf (U).....	12,000	5,000	38	.61	19.6	8.2	7
Oak, white .....	11,000	5,900	46	.74	14.8	7.9	11
Pine, short leaf (U).....	7,000	3,500	32	.51	13.7	6.8	12

NOTE: Specific Gravity and weight per cu. ft.—for 15 per cent moisture content.

(T)=Trautwine, Civil Engrs. Pocket Book (Values Average).

(U)=U. S. Dept. Agriculture Report.

Other Values taken from Aircraft Design Data—(Strength Values—Minimum) (Weight—Average)

Unfortunately, wood can seldom be utilized to advantage in tension, because failure generally takes place by shearing, or in local crushing at the bolts or other connections through which the load is applied. Reliable data on tensile strength of woods are therefore scarce. The available values are, for the most part, remarkably high in strength-weight efficiency.

The woods have been arranged in the order of their value in compression, but their order of merit in tension is also given. Balsa wood is far in the lead, having nearly twice as high a factor in compression as any of the other woods. Tensile values for Balsa wood, would have at least an academic interest. The other woods compare, in compression, with good casting alloys, having factors around 10.

In tension, white ash, spruce, mahogany, birch, cedar, and others compare with alloy steel of 150,000 to 200,000 psi. tensile strength, and with duralumin, while all of the woods listed are above steel of 100,000 psi., whose factor is 12.7.

## Strength-Weight Efficiencies Compared

The cross-section area and the specific gravity of such materials as cord, rope, cable, fabric, etc., are not generally known nor easily determined, and they are not of particular interest. It is often desirable, however, to compare the strength-weight efficiency of such materials with each other, or with those of other materials such as steel or wood. This may conveniently be done, on the basis of breaking strength and weight per foot of length, from which a conversion constant may be derived for obtaining the equivalent of the strength-weight factor for direct comparison with solid materials. The conversion constant may be derived as follows:

A rod of steel of 1 sq. in. cross section weighs 3.40 lb. per foot of length, and has a breaking strength of, say, 60,000 lb. Its strength-weight factor (from the table) is 7.65. Dividing its breaking strength in pounds by its weight per foot in pounds gives the number 17,650. This

equals 2307 times the strength-weight factor. Therefore, if the breaking strength of a member in pounds be divided by its weight per foot in pounds, and the result multiplied by 1/2307 or 0.000433, the product will equal the strength-weight factor. Or, the breaking strength in pounds times the number of feet per pound, divided by 2307 equals the strength-weight factor.

Thus, a sample of silk balloon cord has a breaking strength of 600 lb. and runs 156 ft. to the pound. Its strength-weight factor is

$$\frac{600 \times 156}{2307} = 40.5. \text{ On}$$

this basis the silk cord can be compared directly with steel and other materials.

Its strength-weight efficiency is seen to be slightly better than that of steel music wire having a strength of 310,000 psi.

TABLE 4  
LINES

Silk and Linen Thread, Cord, Etc.

Breaking Strength, lb.

$$SWF = \frac{\text{Breaking Strength, lb.}}{2307 \times \text{Weight per Foot (lb.)}}$$

Material	Breaking Strength, Pounds	Feet Per Pound	Weight, Pound Per Foot	Strength-Weight Factor
Linen thread, sewing (No. 50/3).....	6.0	19,600	.000056	51.0
Silk thread, sewing (3 strand, machine twist) .....	5.0	20,600	.0000485	44.6
Silk casting line (twisted cord, braided sheath)....	15	6,610	.000151	43.0
Silk tape, special (balloon) .....	290	328	.00305	41.2
Silk cord, balloon (braided, with twisted core).....	600	156	.0064	40.5
Linen thread, sewing (No. 20/3).....	14.0	6,600	.000151	40.0

NOTE: All data from test of samples (Minimum values of strength, average values of weight)

## ROPE AND CABLE

Material	Approx. Diam., Inches	Breaking Strength, Pounds	Feet Per Pound	Weight, Pounds Per Foot	Strength, Weight, Factor
Aircraft steel cable .....	1/16	500	128.	.0078	27.70
19-strand non-flexible.....	1/4	8,000	7.4	.135	25.60
Aircraft steel cable.....	1/16	485	123.	.0081	25.90
7 x 7, flexible.....	1/4	5,800	9.5	.105	23.90
Aircraft steel cable .....	1/8	2,000	34.4	.029	29.80
7 x 19, extra flexible.....	1/4	7,000	8.3	.120	25.20
	3/8	14,400	3.8	.264	23.60
Steel wire rope.....	3/8	8,740	4.75	0.21	18.0
(U. S. Navy specification)...	1	60,960	0.66	1.50	17.6
Manila rope (3 strand).....	1/4	700	51.0	.0196	15.45
	1	8,200	3.78	.264	13.41
	3	61,000	0.42	2.38	11.10

NOTE: (Data from Govt. Specifications—Strength values minimum—Weight, maximum.)



When comparing materials by this method, it is not necessary to know their cross section or density. Only the breaking strength of a given piece, of uniform cross section, and its weight per unit of length are required. For fabrics, paper and the like, it is convenient to use the strength and weight of a strip 1 in. wide and 1 ft. long.

The accuracy of the strength-weight factor depends, obviously, upon the accuracy of the strength and weight figures from which it is derived. For organic materials (wood, rope, linen, etc.) these values are subject to wide variation due to differences in the strength and weight of individual samples, moisture content, etc. Cast metals are also rather variable. Such materials should, therefore, not be compared too closely.

The values given for the diverse materials in the tables represent, for the most part, minimum values of strength and maximum or average values of weight for a good grade of the material in question. The data were taken from the best sources available, including aircraft material specifications, laboratory tests of representative samples, figures quoted by reputable manufacturers for their products, standard handbooks, technical reports, etc. In some instances, it has been difficult to obtain dependable data. The strength-weight factors here given should, therefore, not be taken as final without a check of their accuracy on the part of the user.

#### Unfavorable Characteristics of Wood

It seems hardly necessary to point out that materials must not be compared solely on the basis of their strength-weight factor. That is only one variable in many which determine the usefulness of a material for a given purpose. The essential characteristics having been decided on, the material otherwise suitable which has the highest factor may be selected. Or, when strength and lightness are prime requisites, the designer may go down the list of available materials in the order of their strength-weight factors and select the highest which can be satisfactorily applied to his purpose.

The high position of woods on the strength-weight scale either in tension or compression is based upon their strength parallel to the grain. In other directions, the strength of wood is generally very much less, as is well known. This, and other detrimental characteristics, such as inflammability; variation of strength, dimensions and

TABLE 5  
FABRIC, ETC.

Breaking Strength 1" Strip			
SWF = $\frac{2,307 \times \text{Weight per ft., 1" Strip (lbs.)}}{\text{Breaking Strength, Pounds}}$			
Material	Breaking Strength, Pounds	Weight, Lb. Ft.	Strength-Weight Factor
(A) Parachute silk Warp (2 oz. sq. yd.)	55	.00115	23.0
(T) Brown wrapping paper ("Armor Plate Kraft")..	70	.00233	13.0
(T) Same, treated with airplane dope .....	87	.0024	15.6
(A) Airplane linen (Grade A) (4.5 oz. per sq. yd.) .....	75	.00260	12.5
(A) Balloon cloth (cotton) (not rubberized) (Grade AA—2.1 oz. sq. yd.)	30	.00121	10.7
(A) Canvas No. 1 Warp (30 oz. sq. yd.)	160	.0173	4.0
Filler	200	.0173	5.0

(A)=Data from Aircraft Specification, strength minimum, weight average or maximum.

(T)=Data from test of sample—strength minimum, weight average or maximum.

oz./sq. yd. = (lb./in. strip) 1 ft. long.  
16 x 108

TABLE 6  
MISCELLANEOUS

Material	Ultimate Tensile Strength	Specific Gravity	Strength-Weight Factor
<b>Bakelite Micarta (w)</b>			
Plate, Grade 213-323.....	15,000	1.36	11.0
Gears, Grade 21H.....	18,000	1.36	13.2
Tubing, Grade 213-323...	4,000	1.12	3.57
Plywood, made of Port Orford cedar, cemented with Bakelite.....(t)	7,100	0.531	13.4
<b>Leather, Belting (s)</b>			
Oak tanned, center, single	4,000	.95 (x)	4.2
Oak tanned, center, double	3,600	.95 (x)	3.8
Chrome leather.....	85,000	.95 (x)	8.9
<b>Terne Plate.....(t)</b>	40,000	9. (x)	4.4

w=Catg. Western Electric Co.

t=Test of Sample.

s=Bur. Standards Circular 101, Physical Properties of Materials.

x=Approximate Values.

weight with moisture content; deterioration by various forms of decay; heterogeneity; presence of knots and other internal flaws; detract very greatly from the otherwise high value of wood as a material of construction.

The usefulness of high strength alloy steel is limited in light structures such as aircraft by the thinness to which it can be worked, and its liability to local damage or detail failure, such as crinkling, denting, or tearing, in thin sections.

Where stiffness or resistance to deflection are essential, or where the strength of the member depends upon resistance to elastic deformation, as in long columns, the modulus of elasticity is a determining factor, and the distribution of the cross section as well as its area must be considered.

It has been shown, above, that, as a simple bar in tension, annealed aluminum is about 57 per cent as good as mild steel. However, if a solid round or square bar of aluminum and one of steel of the same length, shape, and weight are compared as long columns in compression, a very different result is obtained, as follows:

Using Euler's formula for long columns with rounded ends:

$$P = \pi^2 EI / L^3$$

or, for a given length

$$P = K EI$$

wherein  $P$  = load,  $\pi = 3.1416$ ,  $E$  = modulus of elasticity,  $I$  = moment of inertia of the section,  $L$  = length of column,  $K$  = a constant.

The moment of inertia ( $I$ ) of a circular section is  $\pi D^4/64$ , and of a square section,  $D^4/12$ , where  $D$  is the diameter or width, as the case may be. The load  $P$ , therefore, varies as the fourth power of  $D$ , and directly as the modulus  $E$ . The area of cross section of a bar of aluminum having the same weight per foot as a bar of steel will be 7.8/2.7, or 2.9 times that of the steel bar, and the diameter or width of the aluminum bar will be 1.7 times that of the steel bar (1.7 = square root of 2.9).

#### Analysis of Aluminum

The moment of inertia of the aluminum bar will therefore be (1.7)<sup>4</sup> or 8.4 times that of the steel bar, whether round or square. The modulus of elasticity of aluminum is about 9,000,000 and that of steel, 30,000,000. The aluminum column would therefore support  $8.4 \times 9/30$ , or 2.52 times as great a load as the corresponding steel column of equal weight. In this case, aluminum is a truly "light" metal of construction, whereas in tension it is "heavy." If the columns were tubular the results would be different, depending upon the limits placed upon outside diameter or wall thickness.

Very thin-walled tubular columns fail by crinkling of

the walls before the load based on the elastic modulus is reached. Here duralumin has an advantage over steel, because the wall thickness of a duralumin tube of a given diameter and weight will be three times as great as that of a similar steel column, and will have a much greater resistance to crinkling. Duralumin has the same modulus of elasticity as aluminum, but is superior for long, thin-walled columns on account of the greater resistance to crinkling in the walls.

The importance given to first cost of materials might be considerably modified by a careful study of strength-weight factors. We measure the strength of a material such as steel by the force required to cause rupture in a given cross section—expressed in pounds per square inch; but we pay for the steel by weight. If *strength*—ability to support a given load—is the commodity we really want, the material having the highest strength-weight factor in proportion to its cost per pound will be the cheapest. For example, alloy steel with a strength-weight factor of 25 is worth at least three times as much per pound as plain carbon steel with a factor of 8. An aluminum alloy casting with a factor of 6 is worth twice as much per pound as a brass casting with a factor of 3, simply on a first cost basis, without considering any other advantages.

Less evident, but often more important, are the indirect economies possible through the use of materials of high strength-weight efficiency. A reduction in weight of a motive structure without a sacrifice of strength will afford notable savings along many lines, such as in power expended in overcoming gravity, as in getting and keeping an airplane in the air, or driving an automobile, train, or trolley car up a grade; power expended in overcoming friction, represented by a loss in bearings, road resistance, etc.; power expended in causing acceleration when starting or speeding up any vehicle, which is lost when the brakes are applied; shortened braking distance, and reduced wear and tear incident to braking; increased life of running gear, bearings, springs and road bed, reduction in load on bridges; lessened inertia effects or reciprocating parts of engines, etc. Or, instead of reducing the gross weight with the advantages outlined above, the *useful* load may be proportionately increased—a saving applicable to practically all carriers, including vessels. If fuel and the like is considered part of the useful load, this will increase the cruising radius.

With a more general appreciation of the desirability of high strength-weight factors some notable developments in metallic alloys may confidently be expected, for the limits in this direction are apparently far from realization.

## Improperly Made Steel a Cause of Failure in Case Hardened Work

A PAPER was read recently before the Chicago Chapter of the American Society for Steel Treatment by E. W. Ehn on the subject of irregularities in case hardened work caused by improperly made steel.

Data presented are the results of several years research in the metallurgical department of the Timken Roller Bearing Co. An abstract of the paper follows:

Failure in case hardening, especially in reference to soft spots, is often due to improper steel. Variation of structure of a carburized piece gives a direct indication whether the steel is suitable for carburizing or not.

Coarse-grained structure in case and core of carburized steel with large crystals of pearlite, and clean cut cementite areas in the hyper-eutectoid zone, are signs of good or normal steel. Curly cementite, disintegration of pearlite in hyper-eutectoid zone, and fine-grain size with rounded pearlite areas in the gradation zone and core are signs of an abnormal steel. Abnormal steel has a tendency to give a thin case of high-carbon content and to form soft troostitic spots in hardening.

The structure of normal and abnormal steel varies with the carburizing temperature and the rate of cooling. Carburizing tests on laboratory scale are easily made.

The variation in carburizing properties is caused by oxides uniformly distributed in solid solution in the steel. The ultimate cause is improper deoxidation of the steel when made, and no later treatment can change these properties.

The influence of the oxides in regard to grain size is theoretically explained by their influence on the solidification of the steel in the ingot and their later obstructing action against grain growth. Disintegration of the pearlite in the hyper-eutectoid zone is caused by the solution pressure from the oxides in solution in the ferrite.

The formation of soft troostitic spots in hardening of abnormal steel is explained by the action of the oxide particles as starting points for the troostite formation. This explanation is founded on the investigations of Portevin and Garvin on hardening of carbon steels.

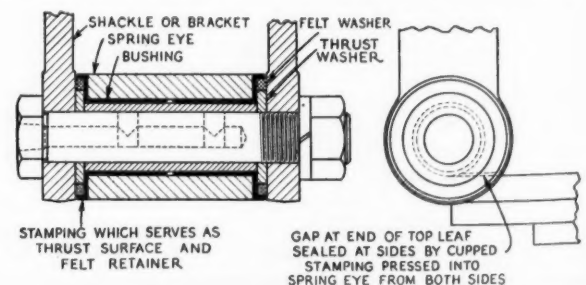
The results obtained in heat treatment of all kinds of steels, notably high and medium carbon steel, is dependent on the presence of oxides in the steel, and many mysterious failures, especially in hardening, are likely to find their explanation by carburizing; and a microscopical examination of the structures obtained.

### Keeps Dirt from Shackle Bushing

A SIMPLE device designed to exclude dirt and retain the lubricant on the bearing surfaces of a spring shackle has recently been patented by H. K. Reinehl.

As shown in the accompanying cut, this device consists of special cupped stampings or bushings and felt retaining washers arranged outside the bronze bushing of the spring eye. The outer ends of the tubular stampings are flanged in such a way as to inclose the felt washer which protects the bearing surfaces from dirt and dust which is otherwise almost certain to enter and cause rapid wear.

Among other claims made for the device are the following: It is economical to manufacture, requires no change in the conventional construction of the spring, mounting brackets or shackle bolts. The cupped stamping which fits into each side of the spring eye forms an uninterrupted, smooth thrust surface and completely covers the gap left in the eye of the main leaf of the spring.



Device designed to exclude dirt from and retain lubricant in spring eye bushing



# Flat Rate System Will Have Marked Effect on Future Car Design

## Facts Developed Show Merit of Vehicle from the Standpoint of Service. Assists Dealers.

By J. Edward Schipper

THE flat rate system should have a material influence on future car designing because of giving the manufacturer a valuable means of determining the serviceability of his product. A design which cannot be economically serviced should not be tolerated. A high flat rate schedule for repairs signifies a design unsatisfactory from a service standpoint. With bookkeeping methods and forms for operating a flat rate system standardized for all dealers and distributors, the factory can make a thorough survey of repair jobs. Then, by a proper analysis and study of jobs performed in all parts of the country, it can secure a service record which should be invaluable to the engineering department.

Any manufacturer using the flat rate cannot realize maximum returns from his efforts in preparing and installing such a system unless he secures from its operation real statistical information about the servicing of his product. Practically every car builder has been thoroughly sold on the flat rate system idea but the final step, cashing in on the service data developed by the flat rate system, remains to be taken.

### Apportioning Overhead, a Problem

With the flat rate coming into general use the customer will soon begin to compare prices charged for similar jobs on different cars. If a car stands out as being expensive to service, it is going to suffer in sales. If it stands out as being economical to service, it is going to benefit tremendously.

While there is no longer any issue as to the general value of flat rates, a number of unsettled issues remain which have to do with the details of installation. These details are of great importance to the car manufacturer. They directly affect the functioning of the system at his various agencies and, consequently, have considerable to do with the profits agencies can make on their service business.

The method of applying overhead to flat rates is one detail about which considerable discussion still revolves. The cost of doing business varies greatly in different service stations. This obviously necessitates a corresponding difference in selling prices of identical jobs, unless differences in overhead are compensated by other factors. Theoretical variation in selling prices for identical jobs should be held within very close limits. Practically, this is not always the case. Close study of the flat rate systems in use indicates that serious study should be made of the methods used in arriving at overhead directly chargeable against service labor.

MANUFACTURERS in general are entirely sold on the flat rate system for dealer repair shops. Some details remain to be worked out.

This article tells about the experience of several companies and shows how the factory can get maximum benefits from the application of standardized methods.

The dealer, especially the small town dealer, is not always willing to go into details as regards overhead. Consequently, the factory organization must work out the problem to some degree. It is not always practicable to do this. The extent to which the factory controls the dealer usually determines the feasibility of the plan. Where factory control is relatively strong, the dealer may be forced to standardize his overhead. The situation is much simplified in such a case.

An investigation of systems now in use shows that the small town dealer can charge the same rate as the large town man in many instances. A great deal of trouble was anticipated by manufacturers on this score when the attempt was first made to establish a flat rate labor charge. It has been found, however, that, while the average labor rate and overhead expense of the small town are much lower, a differential is not generally necessary because the big service station, by reason of better facilities and greater familiarity with the operations, can handle a given job in fewer hours. Thus, the total cost is approximately the same in both cases. Occasionally a small service station is efficiently handled by excellent mechanics that it is able to duplicate the time of the big service stations. In such a case, its profits are higher, but instances of this kind are not frequent enough to affect the situation as a whole.

On the other hand, a great many manufacturers have worked out the flat rate system simply on a time basis, leaving it up to the dealer to fix his labor charge per hour. One of the largest Detroit manufacturers, building over 700 medium priced vehicles per day, has this to say on the point of labor charges:

### Labor Charge Left to Dealer

"We did not attempt to establish the flat rate per hour that should be used by our dealers in developing their flat rate charges to car owners, because, manifestly, dealers in large cities have a great deal more rent, more overhead, and pay larger salaries than do dealers in small cities. The competitive conditions in each location is such that no dealer could afford to charge an exorbitant rate per hour as compared with other service stations in its particular location, so that, by fixing the number of hours per job, we believe we have protected our car owners against unreasonable charges.

"The development of the flat rate has led many dealers to see the possibilities of economy through efficiency in their service stations. Some of them never considered this under the old method of charging by the hour. The

car owner profits, of course, by the increased efficiency."

The viewpoint of another Detroit manufacturer, who is making more than 100 high-priced cars per day, on this same point gives a somewhat similar picture of the situation. The manufacturer says:

"The thing that makes difficult a uniform flat rate system by the manufacturer is the fact that the mechanic's charges and overhead charges are less in small towns than in large cities. Uniform flat rate charges are certainly desirable, but where they are uniform the manufacturer is either permitting the smaller dealer to make more profits than he should, or is not permitting the larger distributor to make a legitimate profit. Our company has recently standardized parts prices. This has been done by pre-paying carrying charges and war tax. This is practical and, in our judgment, desirable as far as parts prices are concerned, but whether or not it is going to be practical to have uniform labor charges is certainly open to question."

In a nutshell, the question is whether or not the increased efficiency of the large shop offsets the lower overhead and labor charge of the small shop. Certainly, it goes a long way toward doing so and the small final differential between the two should not be a serious stumbling block in the way of the operation of flat rates.

### Flat Rate Idea Gaining Rapidly

Although the genesis of the flat rate system was only two years ago, and although it has been used to a large extent for only about a year, the entire distributing organizations of various factories are rapidly becoming 100 per cent sold on the idea. The Dodge company, for example, which has had flat rate in use for about a year and a half, has more than 75 per cent of its dealers now using this system, and it is expected that the balance of the organization will be included within the current year. About 70 per cent of the Hupp organization is using the flat rate, 20 per cent on the flat rate piece work system and 50 per cent on flat rate only. Other Hupp distributors and dealers handle repairs on the basis of standard prices. This organization has absolutely standardized the price of repairs, regardless of the size of the town in which the service station is located.

These few random examples indicate that, while the dealer organizations of the big manufacturing concerns throughout the country are not yet 100 per cent sold on the flat rate system, the idea is gaining very rapidly. In fact, it has taken such a hold on the industry that distributors' and dealers' service throughout the United States, except for a negligible minority, probably will be on a flat rate basis by the end of 1923.

This condition is likely to have a marked effect on automobile design. For this reason alone, the manufacturer should make it his business to see that the facts given him by the flat rate system are considered in designing future cars with a view to reducing maintenance expense.

### A Builder of Good Will

Flat rates from the factory standpoint are builders of good will, and good will builds future business. The flat rate system, properly worked out, will hold old customers and gain new ones. Good will is gained because, with the correct system working properly, the customer always knows what his bill will be when he leaves his car to be repaired. He knows exactly when he is going to be able to get it. He is guaranteed that the work will be properly performed and that if it is not further adjustments will be made without expense to him. The customer knows that he is getting exactly the same deal as his neighbor. He cannot accuse the service station of

favoritism, which is one of the most common kicks made by car owners. Many flat rate service stations display their rates in such a way that the customer can read them for himself. There is no chance of argument and it does a service station as much, if not more, harm to win an argument as it does to lose one.

### Helps Keep Dealer in Business

The flat rate system should be of value to the manufacturer because it helps keep the dealer in business. Many dealers have failed, not because of failure to sell enough cars, but because they have lost money on service work. Proper application of the flat rate system will stop loss of money through the service department. The flat rate schedule will indicate immediately to the dealer just how long a given job should take. If service losses have been due to poor quality of labor in the service department, the dealer can quickly check them by demanding that his men do the work in the time allotted by the factory time study. While these direct benefits to the dealer are also direct benefits to the factory, they help to reduce dealer turnover, which is one of the biggest sources of economic waste in the automobile business.

The manufacturer has not established a real flat rate system if he simply makes a time study on individual jobs and then turns the schedule over to the dealer. This is only the first step. In addition, the manufacturer should tell the dealer exactly how to figure his cost, using the flat rate time as a basis. He should provide the dealer with a standardized set of forms which will enable the dealer systematically and economically to follow any repair job through the shop, from the time it enters until it is delivered to the customer. The system should be so arranged that the dealer cannot superimpose upon the flat rate system any ideas of his own which would tend to eat into the profits.

From the experience of the last two years on flat rate work, it has been shown that, in any shop large enough to have a steady volume of work passing through, the real benefit of the flat rate system can best be secured by combining it with piece work pay for the mechanic. The factory should insist that this system of handling the work is followed, because it enables the dealer to cash in even more completely on the flat rate system with a correspondingly greater profit for himself and better workmanship on repairs. The latter is possible because a higher class of mechanics can be attracted, particularly in view of the fact that recompense on the piece work system usually is higher and an energetic workman is rewarded for his application and skill.

### Flying Fields Too Inaccessible

ONE of the things hindering the development of civil aviation is the inaccessibility from the centers of the largest cities of the nearest landing fields.

In England it is now proposed to remove the London terminal flying field from Croydon to some more convenient place. The matter has been under consideration by the Civil Aviation Advisory Board.

There are two other flying fields near London besides Croydon, but of these that at Cricklewood would not be suitable for heavy machines because of the uphill "take-off" in one direction. The other, at Hendon, is more suitable and the board recommends that it be regarded as a reserve for the future. Many new sites were considered.

The final recommendation made is that the Croydon Field should be enlarged and the building accommodation thereon improved at an estimated cost of approximately \$1,000,000, and that a site at Gunnersbury should be acquired with a view to its future use as a flying field.



# Automotive Exports from United States by Customs Districts, 1922

(The data presented here are available in this form for the first time.)

## Domestic Exports of Automobiles and Parts from United States Customs Districts, Calendar Year 1922

Customs Districts	Passenger Cars Except Electric, Valued up to \$800 Inclusive		Passenger Cars Except Electric Valued over \$800, up to \$2,000		Passenger Cars Except Electric Valued over \$2,000		Parts of Except Engines and Tires	
	Number	Dollars	Number	Dollars	Number	Dollars	Pounds	Dollars
Maine and N. H....	23	\$8,490	11	\$12,535	6	\$18,146	72,847	\$49,244
Vermont .....	30	9,380	25	36,075	13	70,338	273,765	127,635
Mass. ....	55	24,106	28	41,695	8	25,015	53,689	16,390
Rhode Is. ....	1	175	.....	.....	.....	.....	.....	.....
St. Lawr. ....	58	20,819	80	112,149	42	140,821	327,030	182,448
Rochester .....	.....	.....	.....	.....	1	10,360	10,378	1,809
Buffalo .....	81	37,861	135	185,441	83	254,662	5,512,512	1,494,485
N. Y. ....	26,766	12,436,245	14,112	15,009,848	899	2,754,119	76,335,821	18,156,064
Phil. ....	589	257,247	22	25,455	3	8,550	2,084,068	354,363
Md. ....	254	122,647	20	20,598	6	16,550	2,153,481	442,772
Virginia .....	43	26,326	60	66,359	2	5,200	1,840,262	349,634
S. Carolina .....	1	200	.....	.....	.....	.....	271	245
Georgia .....	.....	.....	.....	.....	.....	.....	60	35
Florida .....	278	484,172	222	282,451	106	268,860	1,180,559	338,016
Mobile .....	1	500	.....	.....	.....	.....	8,537	4,786
N. Orleans. ....	167	107,931	53	57,651	3	10,000	400,187	163,581
Sabine .....	6	2,685	2	2,140	.....	.....	48,709	33,322
Galveston .....	8	3,724	8	8,323	.....	.....	39,971	12,698
San Antonio. ....	4,584	1,949,062	1,554	1,637,678	152	393,949	2,003,561	579,443
El Paso .....	312	129,834	94	107,393	8	26,117	84,713	32,882
San Diego .....	75	34,579	28	37,711	1	3,100	3,411	1,711
Arizona .....	227	94,117	54	64,753	6	15,298	123,334	52,620
Los Angeles. ....	38	17,410	15	22,600	6	23,250	49,388	34,898
San Francisco. ....	416	258,586	230	272,567	43	135,435	541,858	330,295
Oregon .....	132	93,647	39	39,879	.....	.....	21,533	10,587
Wash. ....	410	246,834	312	348,502	41	107,414	881,465	309,269
Alaska .....	.....	.....	.....	.....	.....	.....	1,742	1,124
Hawaii .....	12	6,460	8	12,200	2	2,200	5,065	632
Mont. and Idaho. ....	138	44,240	8	9,800	2	5,163	9,784	7,593
Dakota .....	260	142,506	442	534,846	45	115,075	528,575	265,898
Duluth and Superior	66	41,425	36	46,307	6	16,745	47,952	19,332
Mich. ....	6,191	3,900,589	4,901	5,578,607	537	1,479,427	64,787,937	14,595,271
Ohio .....	1	600	30	43,093	4	14,420	1,071,893	325,188
Porto Rico. ....	11	2,850	3	4,685	1	2,500	19,784	3,962
Total .....	42,234	\$20,505,256	22,532	\$24,621,341	2,025	\$5,923,219	160,524,142	\$38,298,032

Customs Districts	Electric Trucks and Passenger Cars		Motor Trucks and Buses, Except Electric up to 1 Ton Inclusive		Motor Trucks and Buses, Except Electric over 1 to 2 1/2 Tons		Motor Trucks and Buses, Except Electric over 2 1/2 Tons	
	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars
Maine and N. H....	.....	.....	1	\$150	1	\$1,250	.....	.....
Vermont .....	1	\$300	1	1,120	2	1,925	.....	.....
Massachusetts .....	.....	.....	2	525	.....	.....	.....	.....
St. Lawrence. ....	.....	.....	2	550	3	8,936	21	\$95,867
Buffalo .....	6	10,908	5	5,362	43	83,881	68	179,593
New York. ....	268	349,186	6,662	2,401,594	1,133	1,543,921	299	779,787
Philadelphia .....	.....	.....	6	4,668	30	34,000	.....	.....
Maryland .....	.....	.....	2	2,868	3	6,020	.....	.....
Virginia .....	.....	.....	33	51,826	32	44,187	11	17,462
Florida .....	4	2,720	263	84,801	36	34,154	8	19,176
New Orleans. ....	.....	.....	17	12,945	31	47,916	7	28,219
Sabine .....	.....	.....	1	1,215	2	6,396	.....	.....
Galveston .....	.....	.....	2	1,768	1	3,606	.....	.....
San Antonio. ....	2	1,970	639	247,221	69	85,211	11	38,562
El Paso .....	.....	.....	43	19,887	14	24,697	14	21,179
San Diego .....	1	1,000	6	3,365	6	7,789	2	5,015
Arizona .....	1	950	72	32,489	18	9,905	1	3,500
Los Angeles. ....	5	5,800	4	2,051	10	6,222	.....	.....
San Francisco. ....	2	1,200	14	8,867	50	61,395	27	84,728
Oregon .....	.....	.....	3	2,274	7	6,798	.....	.....
Washington .....	19	55,090	14	11,640	58	85,274	62	189,019
Alaska .....	.....	.....	2	1,573	.....	.....	.....	.....
Hawaii .....	.....	.....	3	1,575	.....	.....	.....	.....
Montana and Idaho. ....	2	625	10	3,535	2	1,950	3	6,000
Dakota .....	4	8,356	10	9,861	69	97,557	23	45,629
Duluth and Sup. ....	4	1,900	34	28,684	50	59,886	2	3,043
Michigan .....	6	10,262	439	324,513	744	717,087	115	312,894
Ohio .....	.....	.....	.....	.....	34	92,600	29	97,297
Porto Rico. ....	.....	.....	.....	.....	2	4,248	.....	.....
Total .....	325	\$450,267	8,290	\$3,266,927	2,450	\$3,076,811	703	\$1,926,970

# Alcohol Yields Higher Thermal Efficiency Than Other Fuels

Detonation does not occur at compressions as high as 8 to 1 but some tendency to preignition is noted with 7 to 1 ratio. Increase in water content up to 10 per cent is an advantage especially under high compressions. No corrosion in engine.

**A**CCORDING to an interim report recently issued by The British Empire Fuels Committee dealing with the subject of alcohol as a fuel for internal combustion engines it has been definitely proved that:

1—Alcohol can be employed from the low compression used on kerosene engines up to a far higher compression than can be used on any gasoline.

2—The thermal efficiency obtainable with alcohol is higher than with gasoline or benzol.

3—Under all conditions of throttle or mixture alcohol requires the spark more advanced than is the case with gasoline or benzol, and much more advanced with weak mixtures.

4—There was no evidence at any piston speed attained in the engine that the rate of combustion of alcohol under the conditions obtaining was too slow to obtain the maximum effect.

5—Detonation does not occur at compressions up to 8—1, and preignition does not occur at 6—1, even when running for long periods at the highest possible power output of the engine.

6—There was no evidence of corrosion in the engine.

7—The power output and efficiency are increased by low temperature of the circulating water.

8—Supplying heat to the carbureter reduces the power output, but slightly increases the thermal efficiency.

9—Increase in the water contents up to 10 volumes per cent is an advantage, particularly in very high compression engines.

It was found that at all speeds, both with high and low compression, the thermal efficiency obtained with alcohol was higher than that obtainable with gasoline or benzol at any compression which could be employed with them. Even at the low compression of 3.8—1 the thermal efficiency with alcohol is substantially greater than that obtained with gasoline under similar conditions. In both cases the efficiency is almost independent of speed. The heat delivered to the circulating water is less in proportion with alcohol than with gasoline.

It was further found that, compared to gasoline or benzol, the thermal efficiency obtained with alcohol is equally high at high or low compression.

The tendency to preignition began to be evident at 7—1 compression ratio.

## Alcohol Consumption Higher

Owing to the lower heat value of alcohol, the fuel consumption is much higher than is the case with gasoline, in spite of the higher thermal efficiency, if they are used at the same compression, but the fuel consumption can be reduced much further in the case of alcohol than in the case of gasoline by increase of compression ratio.

The first portion of the report deals with experiments carried out with 95 volumes per cent alcohol; these experiments were divided into four series as follows:

Series 1—Tests for power output and consumption over the complete available range of mixture strength with open throttle at four different piston speeds from 800 to 2000 ft. per min. and at compression ratios of 3.8—1 and 7—1, with constant heat to the carbureter.

Series 2—Tests of power and efficiency over complete range of mixture strength at 0.8, 0.6, and 0.4 of full load, with piston speeds of 1200 and 2000 ft. per min. and a compression ratio of 5—1, with constant heat to the carbureter.

Series 3—Tests over complete range of mixture strength at piston speed of 2000 ft. per min., compression ratio 5—1, constant heat to carbureter, but with the circulating water at the outlet varied from 30 to 90 deg. C.

Series 4—Tests over the complete range of mixture strength at 2000 ft. per min. piston speed, at a compression of 5—1, varying the heat input to the carbureter from nil to 2000 watts.

## Behavior of Fuels Identical

The throttle tests (Series 2) have shown that the behavior of alcohol and gasoline under variations of throttle conditions was identical.

The influence of jacket water temperature was investigated (Series 3), and it was found that the engine power output was slightly diminished with increasing jacket temperature. The efficiency also fell slightly, as is the case with all other volatile fuels investigated. The reputed increased power obtainable with alcohol engines with hot-water jacket is probably due much more to the diminished piston friction in the warm cylinder than to any other cause.

The experiments in Series 4 have shown that the maximum output from the engine is obtained when no heat is supplied to the ingoing air, but the thermal efficiency is slightly increased with increase of heat to the carbureter.

It has been proved that under all conditions of compression speed or throttle alcohol-driven engines run more sweetly and more smoothly than when running on gasoline. Detonation never occurred under any compression employed, but at 7—1 compression, corresponding to a pressure of 185 lb. per sq. in. there was a tendency to preignition; 6½—1 is probably the maximum compression desirable.

There have been no evidences whatever of any corrosion of valves.

It was decided by the Committee that further experiments should be carried out on similar lines to those



above referred to, but with alcohol at 99 and 90 volumes per cent. strength. The results obtained with these fuels substantiated the earlier work and provided that the mean effective pressure increases as the water content is increased, so long as the whole of the fuel and water is completely evaporated before the end of the compression stroke. The power output was increasing slightly even with the 90 volumes per cent alcohol. The behavior

of the varying amounts of water was studied over compressions ranging from 3.8—1 to 7—1, and it was proved that the presence of water in all cases increases the maximum power output and reduces the heat flow through the cylinder walls. In high compression engines there was found to be a substantial advantage in using alcohol which contains a reasonable amount of water.

## French Government to Sell Alcohol Below Cost

**T**HE bill requiring French importers of gasoline to add 10 per cent of alcohol to the fuel was passed some time ago by the Chamber of Deputies of the French Parliament without discussion. It has been found, however, that ordinary commercial alcohol will not mix with gasoline in this proportion, and the subject has been taken up for discussion by various scientific bodies.

The new national fuel formed the subject of discussion at three meetings of the Society of Civil Engineers (which does not correspond exactly to our American Society of Civil Engineers, but includes in its membership all classes of non-military engineers). It was felt that some standard proportion should be adopted and that 10 per cent of the present gasoline consumption of France is about equal to its alcohol production.

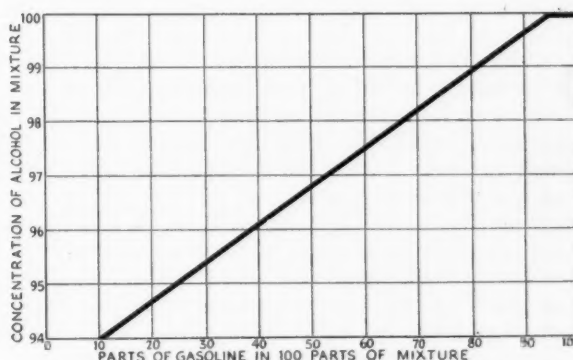
One of the reasons for the present bill, which requires all importers of gasoline, benzol, toluene, etc., to purchase from the Government alcohol equal to 10 per cent of their imports of these fuels, is that the French Government possesses a monopoly on the sale of alcohol and has stored enormous stocks which it must dispose of in some way.

### Alcohol Difficult to Dissolve

Papers read before the Society of Civil Engineers brought out that it is impossible to dissolve completely 95-96 per cent alcohol in gasoline and that to make a uniform mixture it is necessary first to dehydrate the alcohol. This, of course, adds to the cost. When the alcohol monopoly was under discussion the great argument in its favor was that alcohol would be supplied at very low cost for farm tractors, trucks and stationary engines, but the price has not been reduced, and the cost of the alcohol-gasoline mixture, the way things stand now, would be greater than that of gasoline alone. A further disadvantage of the mixture is that it has less heat value than gasoline. It is understood that the Government will temporarily sell the alcohol below cost in order to make possible to market the mixture at the same price as gasoline.

Charles Baron and Albert Verley have investigated the solubility of alcohol of different degree in commercial or automobile gasoline, and their results are given in the diagram herewith. The mixtures were studied for minimum temperature of 10 deg. Cent. Below that temperature the components of the mixture separate out. The conclusion is drawn from this investigation that for the French colonies, where the temperature never drops below 10 deg. Cent., it is possible to make a very good motor fuel by mixing 35 parts of 98 per cent alcohol with 65 parts of gasoline.

Messrs. Baron and Verley found that it is a very simple matter to prepare 98 per cent alcohol by adding to industrial alcohol of 90 per cent one-half its weight of potassium acetate and 10 per cent of one of the higher phenols,



Solubility of gasoline free from benzene, in alcohol of different concentrations

like cresol. Under these conditions, without the use of any rectifying column, which is very important, 60 per cent of the original alcohol changes to 98 per cent on the alcoholmetric scale. The mixture remaining in the still is heated at atmospheric temperature to 150 deg. Cent. and then yields an alcohol of 95 per cent.

The liquid and homogeneous mass of potassium acetate remaining in the still is subjected to the action of a vacuum; it is thus dehydrated and made ready for another operation. No appreciable losses in acetate and phenol have been observed.

This simple process, which only yields 98 per cent alcohol, is not applicable in France, where it is necessary to use almost absolute alcohol. This can be obtained by the process of M. Loriette, making use of calcium oxide. But in order to limit the consumption of lime, which in any case is considerable, it is necessary to start with 95-96 per cent alcohol. This necessitates the use of very powerful rectifiers consuming a great amount of fuel.

## New Spark Plug Has Fibre Protector



**A** VULCANIZED fiber protector to safeguard the porcelain from accidental breakage features the 1923 line of "Spit-Fire" spark plugs placed on the market by the Mosler Metal Products Corp. These plugs are being made in six sizes as follows: 1/2 in. Ford, 7/8 in. standard A. L. A. M., two piece; 7/8 in. long, two piece; 7/8 in. S. A. E. standard, one piece; 7/8 in. S. A. E. long, one piece, and metric.

The insulator is of conical shape designed to keep the nose exposed to direct action of the heat. It is claimed that this form of construction tends to permit the burning off of oil and hence prevent carbonization.

# Future of Carbureter Lies in Detail Development, Not New Inventions

Greater accessibility and ease of adjustment are much needed. Export car equipment must be capable of handling variety of fuels. Drain on gasoline reserves will eventually force study of problem in the United States. Existing devices discussed.

By H. Dechamps

**D**EVELOPMENT in the design of carbureters seems to have reached a dead point some time ago, and it is exceedingly interesting to trace out the laborious paths followed by inventors and designers of all countries in their endeavors to improve this important part of the explosion motor.

Starting from the primitive form, the defects that were recognized were sought to be eliminated first by the application of complicated mechanisms, such as supplementary air valves, to render the carbureter automatic. From a theoretical point of view the problem was solved, but these carbureters were too complicated and not sufficiently dependable in service, and finally it was found possible to secure equal or even better results with substantially simpler constructions without moving parts.

These newer carbureters are generally based on the principle of the air bleed or of supplementary fuel nozzles, often in combination with some other mechanism, so that their mode of operation is not always apparent at first sight. It would seem advantageous to define the problem to be solved, to compare the different possible solutions and thus face the different constructions on the same basis. The discussion will be limited to the main part of the carbureter, the fuel nozzle, and the remaining parts, such as fuel strainer, float mechanism and throttle valve, and the general structure will be disregarded, for one reason because these parts have been developed to a remarkable degree of simplicity and perfection, and do not show any great differences.

According to the earlier view, an ideal automobile carbureter is one which, without outside control, gives a mixture of constant proportion between air and fuel, independent of the engine speed, engine load and throttle position. Recently it has been recognized that the carbureter should deliver a "fatter" mixture (richer in fuel) at low speeds and when the engine is idling than when it is under full load.

## Simplest Form of Construction

In order to make the operations clearer we must go back to the simplest form of the device, shown diagrammatically in Fig. 1 which consists of an air passage of conical form which transforms, with the least possible energy loss, a change in the speed of the air into a pressure difference. The fuel passage *B* debouches close to the smallest cross section of the air passage, the fuel level in the passage being held at the level of the end of the passage by means of a float mechanism not shown. If the sources of both air and fuel are under the same pressure (atmospheric pressure), a depression is produced in the air passage, which, according to the well known principle of the injector results in the ejection of fuel from the fuel passage.

If the quantities of the two fluids delivered in unit time

are denoted by *G*, the cross sections of the passages by *f*, the drop in pressure between the atmosphere and the mixing chamber by  $\Delta p$ , the density by  $\gamma$ , and if the index *l* is used for air and *b* for fuel, the mixture ratio (air to fuel) may be expressed by the equation:

$$\frac{G_l}{G_b} = \frac{f_l}{f_b} \sqrt{\frac{\Delta p_l \gamma_l}{\Delta p_b \gamma_b}}$$

This simple equation is subject to three restrictions:

(1) The coefficients of efflux of the fuel nozzle and carbureter throat have been assumed to be equal to 1; (2) the velocities ahead of the nozzle and throat are negligibly small in comparison with the maximum velocities inside them; (3) the velocity of efflux of the fuel is greater than the "limiting minimum velocity."

## Defect of Primitive Carbureter

Careful investigations on an experimental basis regarding the permissibility and the influence of these simplifying assumptions have been made by others and we will here content ourselves with drawing conclusions from the approximate equation. We find from it that if the cross sections of the passages for the two fluids remain constant, with increasing depression the proportion of air to fuel increases; in other words, the mixture becomes richer, because:

- (1) On account of the higher velocity of the air as compared with the fuel the pressure gradient in the air passage rises more slowly than that in the fuel passage, since a slight depression is created ahead of the air passage, whereas the pressure acting on the fuel in the float chamber continues to be equal to atmospheric.
- (2) The density of the air decreases as the depression increases, whereas the density of the fuel remains substantially constant.
- (3) The simplifying assumptions mask a slight increase in the proportion of the fuel in the mixture.

The equation, therefore, explains the well known defect of the primitive carbureter, of furnishing a mixture which becomes richer as the engine speed increases, whereas the inverse action is desired. But it also indicates the different possible ways of keeping the mixture proportion constant regardless of the suction or depression. These may be divided into two main classes:

- (1) Constant cross section of air passage (venturi).
  - a. Control of the air admission ahead of the venturi;
  - b. Admission of supplementary air beyond the venturi;
  - c. Control of the cross section of the fuel nozzle;
  - d. Admission of air to the fuel nozzle (air bleed);
  - e. Control of the pressure acting on the fuel.
- (2) Variable cross section of air passage (venturi).
  - a. Control of the air passage cross section.



All automatic carbureters are based upon one or the other of those methods, whose number, of course, can be materially increased through the combination of several systems. Before proceeding to a discussion of the different methods of mixture regulation, with the aid of diagrammatic illustrations, it may be pointed out that a rational control of the mixture can be effected only through the depression, the variation of which is the cause of changes in the mixture proportion.

A mechanical connection between the throttle and supplementary air valve, which was extensively used in earlier years and much valued on account of its reliability, can give correct results only under the condition of engine load. This condition is never met with in automobile practice, but the arrangement is justified in connection with aircraft engines. This principle is sometimes applied in newer types of carbureter in order to narrow down the limits of the differences to be compensated, a second control method depending for its action upon the depression being used in addition.

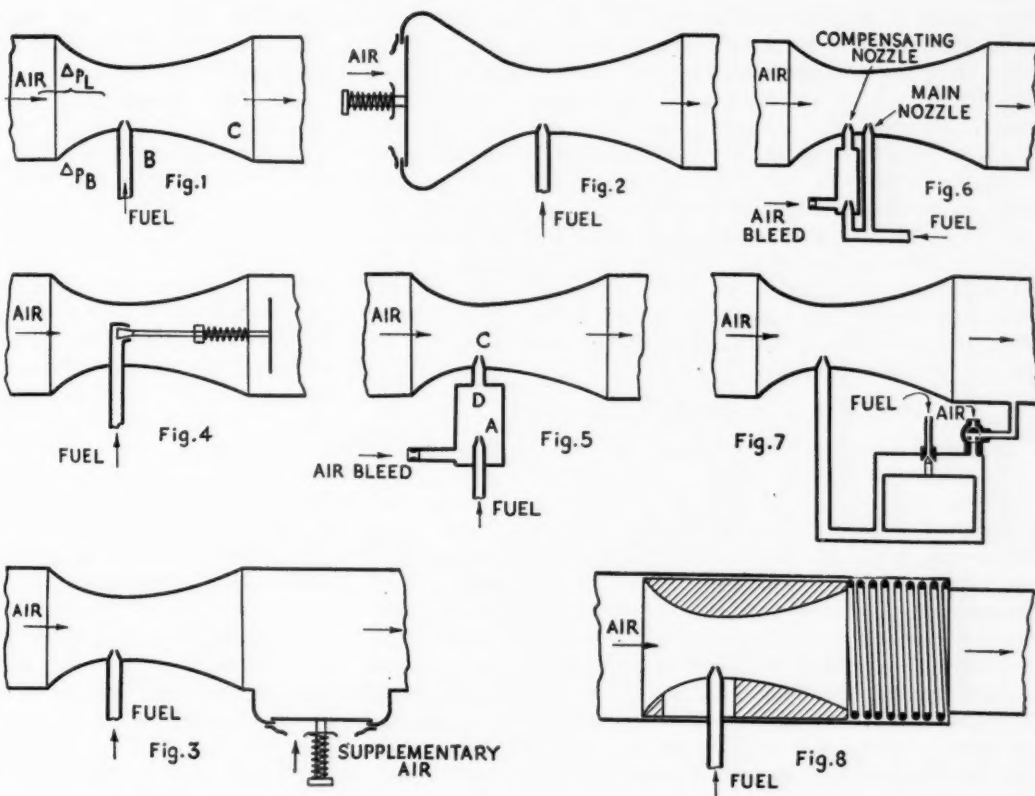
The control of the air admission cross section ahead of the carbureter throat (method 1a) consists in placing a spring-controlled valve in the air inlet to the carbureter with the object of keeping the depression inside the carbureter as nearly as possible constant (Fig. 2). This, however, eliminates only one of the causes of error, and that not even completely.

A particular objection to this method is the reduction in the volumetric efficiency due to the throttling effect of the valve. From a design standpoint the difficulties are similar, but even greater, than with supplementary air valves. This method of control was used for a period before the introduction of special idling nozzle, when the starting of the engines involved considerable difficulties. For the reason that even with low air speeds there is an appreciable depression within the throat, a spring-controlled valve in the air inlet is preferable to a supplementary air valve in this respect. At the present time this method of regulation has been entirely discarded, but occasionally one finds on very large engines a hand-operated valve which can be shut to facilitate starting of the engine.

#### Wide Use of Supplementary Air Valve

The supplementary air valve (method 1b) has found much wider application. Fifteen years ago there was hardly a carbureter that was not fitted with some form of this valve. A great variety of designs was evolved, including sliding valves, poppet valves, ball valves and membranes, with and without dashpots.

As may be seen from Fig. 3, the admission of supplementary air not only diminishes the increase in the depression with increasing engine speed, but also compensates for the increasing fuel content by diluting the mixture with pure air. Notwithstanding the fact that the solution was theoretically correct within certain limits,



and the further fact that it favors a high volumetric efficiency and the thorough distribution and vaporization of the fuel, the supplementary air valve type of carbureter has meanwhile been almost completely displaced by other types. This shows how difficult it is to make such a sensitive mechanism sufficiently dependable.

The same difficulties are encountered in an even greater degree in connection with the method 1c. As indicated in Fig. 4, a disk is placed inside the air passage, subject to the pressure of the air stream on the one hand and that of a spring on the other, in such a manner as to tend to reduce the cross section of the fuel nozzle with increasing air speed.

#### Sensitive Mechanism Unreliable

The design of such a mechanism is particularly difficult because the regulation of very small cross sections is involved, the accessibility is always less than with supplementary air valves, and the shaping of the air passage is unfavorably affected. For these reasons not a single one of the many of the designs of this type evolved withstood the test of practical use in the hands of lay drivers. On the other hand, a development of this method, the use of several nozzles which come into use successively, has found wide application, and especially the use of a special idling nozzle, which will be discussed further on.

In a still more improved form the method is applied in newer three nozzle types. In addition to the idling and full load nozzles, these are provided with a nozzle for partial loads. By a suitable choice of the cross sections it is possible to insure that the engine will start easily on a rich mixture, be quite flexible on a moderately rich mixture under part load and operate very economically on a lean mixture under full load.

The methods of mixture regulation so far described share with method 2a the disadvantage of possessing moving parts, and it is precisely the greater reliability insured by the elimination of these parts which is the chief reason why carbureters without moving parts have more and more displaced all other types.

In the case of the air bleed carbureter (method 1d) the

fuel nozzle *A* does not deliver directly into the venturi but is located back in an intermediate chamber *D* (Fig. 5). This chamber communicates on the one hand, through an adjustable air bleed, with the atmosphere, and, on the other, through the delivery nozzle *C* with the venturi. With increasing engine speed the depression in the intermediate chamber *D* does not increase in the same proportion as in the venturi, because the air entering through the air bleed has a compensating effect. In consequence, the fuel delivery increases more slowly. The fuel and the air entering through the air bleed become mixed as they pass through the fuel nozzle, forming a foam or an emulsion, and the gradual admixture of the fuel with the air assists the vaporization.

### Zenith a Representative Type

The first and best known representative of this type is the Zenith carbureter (Baverey system), which differs from the type described only in that it possesses two fuel nozzles (Fig. 6). Of these the one, the main nozzle, is of the normal type and therefore delivers a mixture increasing in richness with the depression. In connection with the second, called compensating nozzle, the air bleed effect above explained is exaggerated. If the two nozzles are properly proportioned they compensate each other in such a manner that the fuel content of the mixture remains constant. In the actual Zenith carbureter the two nozzles are arranged concentrically, instead of separate from each other as in the diagram, which makes the mode of action less apparent.

In Germany a deviation of this system known as the Pallas carbureter has been developed which has come into wide use and been widely imitated. This carbureter has only a single fuel nozzle, which corresponds to the compensating nozzle of the Zenith carbureter. The air bleed effect, however, is not exaggerated, but so proportioned that the influence of the growing depression on the mixture proportion is compensated. Features of design of the two carbureters will be referred to later on.

Whereas the above described method of regulation depends upon pressure variation at the displaced fuel nozzle by method 1e the pressure behind the fuel is acted upon. By placing the float chamber in communication with a suitable part of the mixing chamber, the pressure on the fuel in the float chamber is reduced below atmospheric (Fig. 7). In the connection between the float chamber and mixing chamber there is inserted a sensitive control device, by means of which an outlet to the atmosphere may be opened more or less. In this way the regulating effect is moderated, especially at low speeds.

### Fuel Saving Regulators

Owing to the fact that a device of this type may readily be applied to existing carbureters, this method of regulation has found wide application in the form of so-called small fuel savers. Such apparatuses, as, for instance, Gillet-Lehman, consist of a small adjustable valve mounted on the cover of the float chamber, which connects with the inlet manifold through a fine tube, the float chamber being otherwise closed to the atmosphere. In the case of poorly designed or improperly adjusted carbureters it is thus possible to effect a saving in fuel.

Practice, however, has shown that the adjustment of this device is very sensitive and generally can be made successfully only by specialists, more particularly because, as a rule, it has to be made with the engine idling and not under brake load or with the car under way. If improperly adjusted the device is detrimental rather than useful.

A few automatic carbureters also make use of this very easily applied method in order to improve the regulation. Thus it is found on the new Zenith carbureter, in which

case the valve can be adjusted from the driver's seat. This permits of adjusting the carbureter to give a rich mixture for idling and partial loads, as it is then possible to readily change to a lean mixture for running under full load.

As the last method of regulation we must mention 2a, variation of the air passage cross section (Fig. 8). This variation may be effected by an axial displacement of the venturi against the pressure of a spring, as well as by means of movable filling members such as shutters, balls, elastic tongues, etc. Depending upon the construction, the fuel nozzle with increasing depression is virtually moved from the minimum to a greater cross section of the venturi, or the minimum cross section of the latter is enlarged. In practice this method of regulation is less frequently met with alone than in combination with some other method. For instance, the sliding venturi may at the same time control supplementary air ports, which is theoretically correct but suffers from the difficulties of design and maintenance already pointed out.

In case of suitable design it is possible with each of the methods of regulation mentioned to compensate within certain limits the effect of the depression on the mixture proportion. On the other hand it is impossible to meet the further requirement that the carbureter should furnish a richer mixture at low than at full speed. However, as this requirement is essential in order to permit easy starting, uniform idling at a very low speed and elastic operation under part throttle, all of the newer carbureters are of the nature of two step register carbureters, as they have a special idling nozzle.

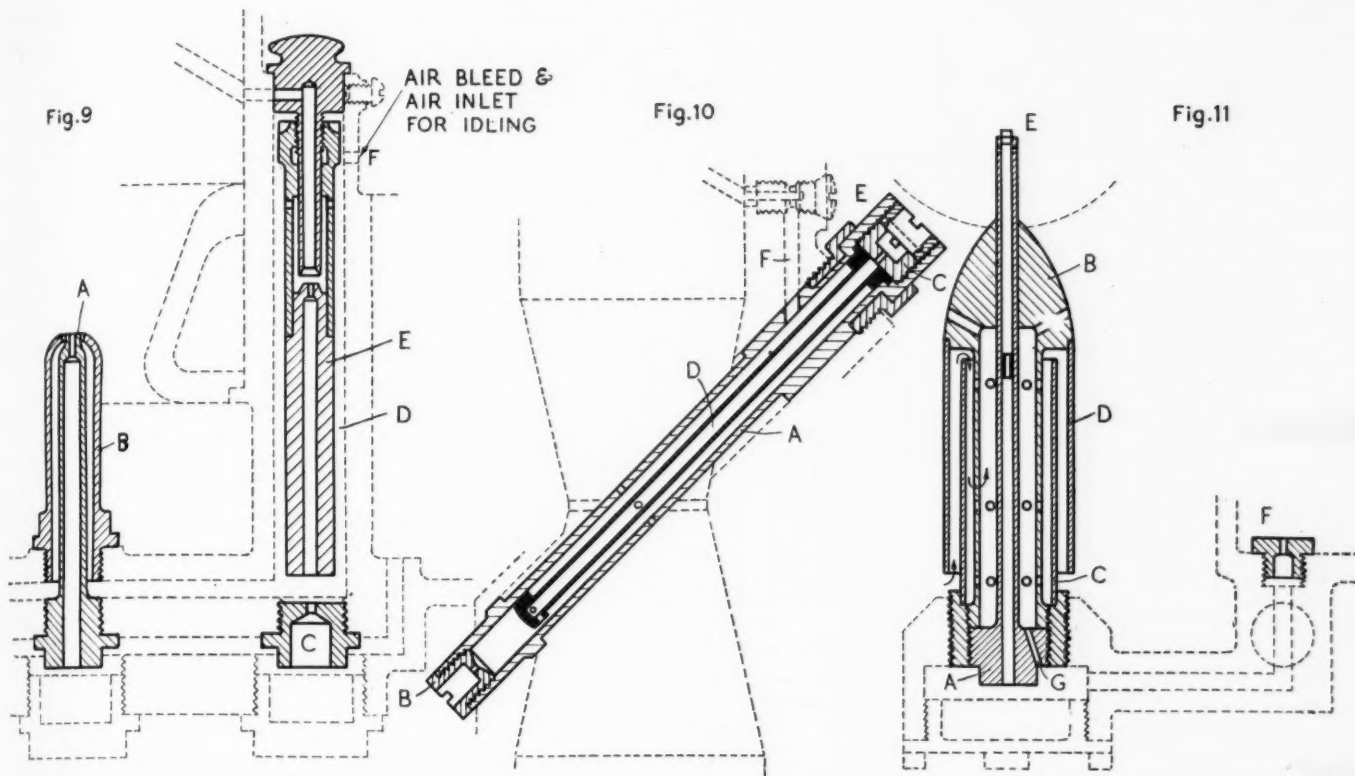
### Action of Main and Idling Nozzles

This nozzle debouches directly into the carbureter at the throttle valve, the throat being formed either by the edge of the throttle disk or a notch cut in same. Owing to the fact that when the throttle is closed there is a strong suction, it does not matter that the idling fuel nozzle is located at a considerable height above the level in the float chamber. When the throttle valve is opened the idling nozzle becomes less effective in the same proportion as the main nozzle begins to deliver fuel. The action of the two overlaps to a certain extent, with the result that the over-rich starting mixture is gradually diluted to the normal proportion.

This so-called transition stage is a criterion of the careful development and adjustment of the carbureter. If a "regulation diagram" is constructed, that is, if the fuel consumptions at different speeds for different throttle positions are determined and the fuel content of the mixture is then plotted as ordinate against the throttle position as abscissa, there should be a uniform decrease of the fuel content. This important and easily carried out test does not seem to be properly appreciated. As a rule, the adjuster depends upon his judgment to find the correct adjustment for the transition stage, with the result that the operation of the carbureter leaves something to be desired.

After the principles of the different methods of regulation have been thus discussed, a few prominent designs of carbureter nozzles will be described. In the Zenith carbureter, Fig. 9, the main nozzle *A* and the compensating nozzle *B* are arranged concentrically one within the other. This results in the most favorable conditions of fuel ejection centrally within the carbureter throat. In as much as the cross section of the compensating nozzle is without importance, no valid objection can be made to the use of an annular slot, which can rarely be made accurate in dimensions. The amount of fuel reaching the compensating nozzle is determined by the metering orifice of nozzle *C*, which latter is very accessibly located. It debouches into





an intermediate chamber *D* provided with the air bleed *F*. Into the same chamber extends the readily removable idling nozzle *E*, so that the air bleed also serves as air entrance for idling.

The idling nozzle consists of two parts that are screwed together and relatively adjustable, so that the cross section for the air inlet for idling is also adjustable. Air enters through drill holes in the upper shell and passes over the top of the idling nozzle, carrying fuel along, and then passes through the central hole and a channel in the wall of the carbureter housing to the throttle disk. When the engine is at rest the chamber *D* fills with fuel to the same level as is maintained in the float chamber, with the result that the compensating nozzle at first delivers a very rich mixture, which facilitates starting, but during operation the fuel level falls again.

This type of carbureter operates excellently, but it cannot be described as simple and easy to inspect. The accessibility and handiness of the adjustment especially leave something to be desired, since it is necessary to stop the engine and disconnect the fuel supply before it is possible to remove the nozzle from below.

#### Pallas Carbureter Construction

With materially simpler means the problem has been solved in the Pallas carbureter (Fig. 10). Without the use of any transverse drill holes, a nozzle assembly *A* passing obliquely through the carbureter effects communication between float chamber, carbureter throat and idling nozzle, and at the same time contains all parts. At its lower end it carries the fuel nozzle *B*, and it extends into the float chamber which surrounds the throat of the carbureter. The air bleed *C* is set into the upper end of this assembly and is protected by means of a wire gauze against the entry of dust, etc. Air entering through the air bleed flows through the central tube to the outlet orifices at the lower end. It then mixes with the fuel, and the resulting emulsion passes through the orifices at the middle of the nozzle body into the throat of the carbureter. From another orifice in the nozzle body there branches the chan-

nel *F* to the idling nozzle *E*, which discharges against the throttle disk.

In comparison with other designs the unusual simplicity of this carbureter arrests attention, and it also has advantages from an operating point of view. With a single movement the nozzle assembly with the fuel nozzle and air bleed can be taken out for cleaning or change of nozzles. This can be done so quickly that experienced mechanics in the engine test room not even stop the engine.

#### Air Bleed Emulsifies All the Fuel

Fears might be entertained that the comparatively large nozzle carrier, which passes through the throat of the carbureter at an angle, would unfavorably influence the uniformity of the air flow and the mixing of air and fuel, but in practice no disadvantage of this kind has been experienced. It seems even that the fact that the air bleed emulsifies the whole of the fuel instead of only a portion of it, as in some other carbureters, has a favorable effect.

A design which deviates sharply from those so far described is the Claudel, Fig. 11. The main nozzle *A* is arranged centrally. Its upper extension *E* at the same time serves as idling nozzle and extends into the plug type of throttle valve. The cross section which determines the fuel delivery is formed by a contraction at the middle of the vertical passage above which there are lateral orifices. In addition a nozzle *F* is set into the bottom of the float chamber which acts as metering orifice for both nozzles.

The compensating nozzle is formed by an inclined drill hole *G* in the base of the main nozzle *A*. The fuel rises in the annular space between the inner nozzle tube *A* and the shell *B* to the level of the float chamber. In the wall of the shell are provided orifices for the air bleed. As the shell *B* is surrounded by another tube, another annular space is formed. The bleeder air enters around the lower edge of a fourth concentric tube *D*, and, flowing over the upper edge of *C*, passes into the mixing chamber, where the emulsification takes place. The fuel from both nozzles then passes through the inclined orifices in the head of shell *B* into the throat of the carbureter. This carbureter

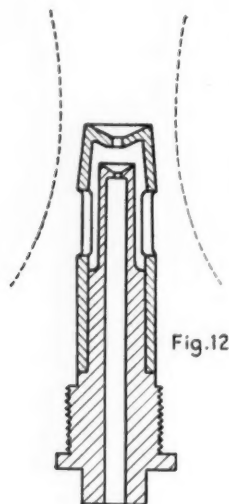


Fig. 12

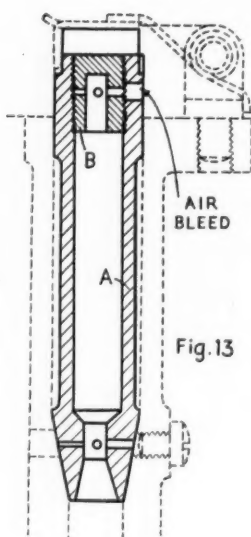


Fig. 13

has excellent starting qualities but from the standpoint of accessibility it leaves something to be desired.

An example of a simple but not equally meritorious design is shown in Fig. 12. Here the main nozzle is surrounded by a shell provided with slots. Through these slots a part of the air passes to the nozzle, and, together with the fuel, is ejected through the larger nozzle above. The designer probably expected that with this construction he would get somewhat the same effect as with an air bleed. This, however, is not the case. All that is achieved are a stepwise admixture and vaporization of the fuel, as well as a stronger suction effect, similar to that of the multiple venturi, which may favorably influence the fuel consumption and the flexibility of the engine.

The adjustment of carbureters of the type described is not so simple, because in addition to the main nozzle and the venturi, there are two or three other metering orifices—compensating nozzle, air bleed and idling nozzle. Besides, in the case of the engine on the car, when running without load, it is impossible to immediately recognize the effect of a change. In order to facilitate this work the manufacturers of carbureters issue service instructions, and furnish a set of calibrated and numbered nozzles which can be interchanged. But as every practical man knows, it often happens that these parts are not at hand when wanted, or that there is no time to systematically test them out.

#### Turns Permits Easy Adjustment

An attempt to obviate these difficulties has been made in the Sum carbureter, Fig. 13, whose nozzle A is provided with four radial fuel metering orifices, any one of which can be brought into action by turning the nozzle through a right angle. In the same way the plug at the top of the nozzle is provided with four radial holes, any one of which will serve as the air bleed. The plug, as well as the nozzle itself, is firmly held in place by a spring-pressed cap over its square head and carries markings to show what orifice is in the working position. This makes it possible to test out the effect of an adjustment with the engine under load. As the complete nozzle may be removed from the top without disconnecting the fuel supply, this design may be regarded as a model in this respect.

In the case of most of the carbureters referred to, the idling nozzles have a special fuel passage leading to them. Owing to the high suction produced when the throttle is closed, this may be dispensed with, for the sake of simplicity, and the fuel may be drawn from the main nozzle through a tube above it (Fig. 14). By varying the height

of this suction tube A a convenient means of adjustment is provided at the same time. The illustration shows another improvement, which consists in the fact that the idling nozzle does not debouch directly into the wall of the carbureter, but a small fitting B is inserted which projects slightly into the gas passage. This results in keeping the starting and idling mixture away from the cold wall and therefore minimizes the formation of drops. The throttle disk is provided at this part with a notch which intensifies the spraying effect on the injector principle.

#### High Output Versus Flexible Operation

When adjusting the carbureter on the engine on the test block, comparatively large venturis are often selected, for the sake of maximum engine output, but when such an engine is assembled on the car the results are often disappointing, the engine not being sufficiently flexible. The reason is quite apparent. It is true that a large venturi keeps down the pressure drop and thus tends to insure high volumetric efficiency, but a carbureter is the more sensitive with respect to the mixture ratio the lower the pressure drop. And, besides, as a high air speed is of the highest importance in connection with the intensity of atomization and thoroughness of admixture, it is necessary to compromise between high output and flexibility of operation.

In this connection the introduction of double venturis on carbureters for aircraft engines represented a real step in advance, which, like so many other improvements, has meanwhile been adopted also for automobile engines. As shown in Fig. 15, the fuel is introduced at the circumference of a small venturi which is set concentrically into the main venturi in such a way that its upper edge is in the same plane as the narrowest section of the main venturi. As a result, the effects of the two are combined and a very strong depression is produced on the fuel nozzle, with little influence on the volumetric efficiency. As only a portion of the air passes through the small venturi, the admixture takes place stepwise, which in connection with the high speed at the fuel nozzle greatly aids in the vaporization and prevents the settling of the fuel on the walls.

In the latest type of Zenith carbureter this effect is further intensified by placing three venturis one inside the other (Fig. 16). In addition there has been provided a control of the air bleed operable from the driver's seat, the air bleed communicating with the idling nozzle on the one hand and with the compensating nozzle on the other. In starting, the communication with the atmosphere, as well as that between the two channels, is shut off. The idling nozzle therefore delivers its maximum, and no air bleed is used in connection with it. As soon as the motor has warmed up sufficiently, the idling nozzle is placed out

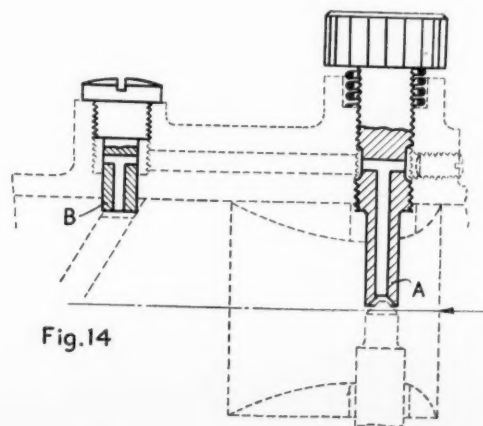


Fig. 14



of action by putting it in communication with the atmosphere, with the result that the fuel consumption decreases somewhat. Finally, under full load, by means of another operation, the air bleed is rendered more effective, thus permitting very economical operation.

It will be seen that the demands made upon carbureters today with respect to the adaptation of the mixture ratio to the operating conditions have become such that they no longer can be met with purely automatic apparatus, and it has been found necessary to return to the once discarded hand control. Such solutions, however, are justified only on low reduction, powerful sport type cars, which are required to be capable of running at very low speed in high gear in congested traffic and at the same time develop high speed and be good hill climbers. For the ordinary utility car the automatic operation of the modern carbureter is entirely sufficient.

For the further development of the carbureter we must probably look less to the invention of new systems than to the detail development of existing types. Such detail improvement should have for its chief object greater accessibility and easier adjustment, which features in most cases leave much to be desired. A further object should be the availability of the advantages of the double venturi

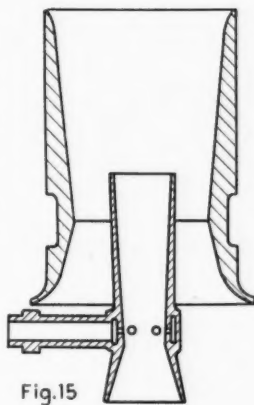


Fig. 15

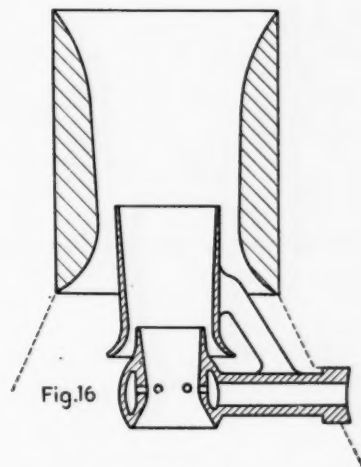


Fig. 16

for all types. A special problem in this connection is the design of a double venturi that is just as accessible as the simple venturi. Another possibility of development lies in the construction of triple venturi carbureters. There is, therefore, no lack of problems confronting carbureter designers.

## Fabric Used as Flexible Member for Two-Arm Disk Joint

A MODIFIED form of flexible disk joint, which it is claimed can be successfully used with two points of attachment on each side in place of the usual three points, has recently been patented by C. H. Clark. This joint, as will be seen from the accompanying cut, employs fabric as the flexible member, but is reinforced by sheet metal stampings which, in this case, are vulcanized into the fabric disk. It is claimed that the fabric is flexed less than that employed in the usual three-arm type. According to the inventor the joint is also less apt to be thrown out of alignment, owing to the fact that the reinforced fabric is stretched less than that used on the three-arm type.

Among other claims made for this type of joint may be mentioned the following:

It requires no more total thickness of fabric, not including the spacing between disks of the three-arm disk type, and no greater disk diameter than the three-arm type requires. This is said to be due to the reinforce-

ments which reduce the strain on the fabric to a minimum.

For substantially straight drives, such as that between engine and gearset, the coupling can be used as a four-arm type, capable of transmitting about twice as much torsional load as other types of similar dimensions.

The disk can be made from ordinary rubberized fabric, not controlled by a patented process.

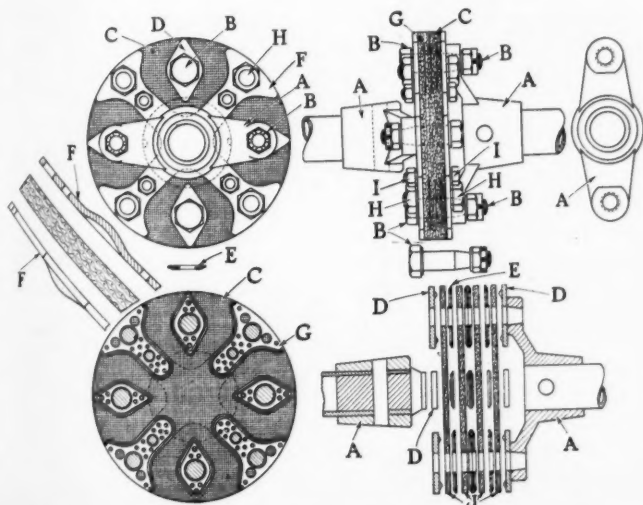
The coupling works best with a single disk into which the several reinforcing washers are molded. The reinforcements are so designed that they form a metal lining for the bolt holes, thus tending to prevent misalignment, and to facilitate easy assembly.

It is claimed that the outer washers and outer reinforcing elements work in combination with the inner washer and inner reinforcing disk element so as to prevent the fabric from pulling out from between the metal parts when the fabric is subjected to torsion.

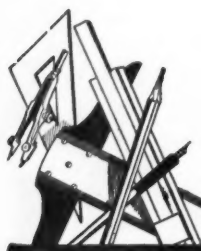
The coupling consists of the following parts: Two coupling hubs, A; four tapered disk bolts, B, and one assembled disk C, built from the following material: eight 3/16-in. steel disk bolt outer washers, D, 8 similar inner washers, E; 2 outer reinforcing plates, F; 12 inner reinforcing washers, G; 4 reinforcing plate bolts, H, and 4 reinforcing bolts, I and J.

This joint is not yet being manufactured, but manufacturing rights are now being offered.

CITROEN-KEGRESSE creeper band automobiles are to be used by the French Line steamship company for the passenger services it organizes in Algeria, Tunisia, and Morocco. The first use of these vehicles will be made for sightseeing trips from Touggourt, in Southern Algeria, to Tozeur, in Southern Tunisia. At present the round trip is made by camels, mules and horses, and occupies ten days. With the use of Citroen creeper track cars the journey will be cut to three days. Next season a more extended use will be made of Citroens for other passenger services in Northern Africa.



C. H. Clark's two-arm reinforced fabric disk coupling



# The FORUM



## Poor Service Not Responsible for Used Car Problem

*Largely due to social rejection. Distributors and dealers making rapid strides in selling service.*

Editor, AUTOMOTIVE INDUSTRIES:

HAVING read the article "Poor Service Is Largely Responsible for the Used Car Problem," by Louis Ruthenberg, and having thought over it for several weeks, and having heard it referred to by some manufacturers of shop equipment, I am inclined to think that we on *Motor Age*, who have given much of our time to the study of the maintenance situation, will take exceptions to some of the various statements in this article.

In the first place, I am going to disagree almost entirely with the statement of the title of the article—that is, unless Ruthenberg will concede that a proper painting, trimming and furnishing shop should be a part of the equipment in the maintenance shop today. It is true that it should be, but it is a lamentable fact that in practice it is not true. By this I mean that the used car problem is due chiefly to the social rejection of the car rather than for mechanical reasons. It is very true—and most dealers will tell you so—that a great many of the cars that find their way into the used car market are in wonderful running condition, but that the painting, upholstery, and tops are not such that the owner thinks will maintain his social prestige.

It is a very lamentable fact that the promoters of painting and trimming operations have never worked closely with the maintenance industry, and consequently there is an amazing lack of information in the maintenance industry regarding these operations.

Ruthenberg gives credit to the driver of the livery vehicle. These liverymen are not the only ones who take care of their cars and have sweet running cars after 50,000 or 100,000 miles of operation. The same will be found to be true of many private owners, and many a man turns in a used car which is sweet running with the statement:

"I would like to have this old engine in the new bus, but the body has many squeaks and rattles, and looks like a last year's bird's nest."

### Dealers Making Strides in Service

Now take Ruthenberg's theory of how service should progress. He apparently overlooks the fact that the connection between the factory and the average dealer is not close enough at present to permit the operation of the scheme he suggests. As a matter of fact, in practice the great mass of dealers in this country are controlled and directed by distributors, and not by the factory. It is true that, had the factories undertaken what Ruthenberg suggests a number of years ago, they could have made wonderful progress; but the fact that they did not do this

is history, and the present practice must be continued unless we are to lose it in bringing about a proper maintenance industry.

I believe that the dealer whom Ruthenberg quotes as to the method of selling service is today in a great minority. I really believe that most dealers, and especially those dealers who are prosperous, are making great strides in their appreciation of service, and in the selling of service. The great interest in the flat rate system shows that this must be true. The dealers as a mass are striving in every way they can to turn this former leak in their business into a source of profit. Also, the dealer is going to realize fully and completely that the customer is the boss.

### Maintenance Plants on the Increase

We on *Motor Age* who have been watching this situation are thoroughly convinced that the maintenance division of the automotive industry is making, and has made in the last two or three years, wonderful strides. This has been brought about by a better class of salesmen, dealers realizing that maintenance is the big question in the owner's mind today; that when they sell the car they must also sell the maintenance, and see that maintenance is properly given, or that they will not have a repeat customer. The better class of dealers and distributors are alike awaking to this, and they are building a system entirely their own, with more or less factory assistance.

Many a distributor has put in within the last year a maintenance plant that is calculated to serve, not only the needs of his retail department, but the heavier operation needs of his smaller dealers. After putting in such a plant he has urged his dealers to sell better and more complete operation, and to send to him any operations they cannot perform with the equipment of their smaller shops. In this way the car is kept in friendly hands at all times, and the guarantees or warranties of the dealer are always operative.

And I want to say here that no man who has not associated closely with the dealer field realizes to the slightest degree the fullness of the operation of the warranty. Axle companies, and transmission and engine companies are all going full length to replace defective material—even after the car has been in operation for months. I have in mind an axle housing that had a weak point, and many breakages resulted. The company that made this axle is still replacing this housing where a break develops, and the axle was manufactured in the early part of 1920. Most dealers know this, although a few do not, and a few dealers do not care. There are a few complaints about this axle which are not settled, and when these come to



**Motor Age** the dealer is advised to take it up with the axle maker and always gets satisfaction.

It is through this dealer-distributor appreciation of better service and the work done by dealers in a certain community that is carrying forward the great improvement in maintenance today. The factories are giving such assistance as they can and as they know how to give. It is a lamentable—but nevertheless true—statement that the factories started on the wrong foot in service, and all of them have not yet recovered, and what is now known as the service department was invariably established as a parts selling department. In quite a number of instances it is still so regarded by the factory. However, some of these parts selling executives have proved themselves to be equally appreciative of the service situation, and, apparently without authority from the factory chiefs, have gone ahead and organized a real service department. Some of these departments are operating with considerable satisfaction today, and some are just beginning to realize their obligation.

It is our opinion that the improvement in the factory service departments is keeping pace with the improvement of the maintenance departments of the dealers, but the point that I want to make especially is that this improvement is coming from below and reaching to the factory, and not from the factory to the dealer. If we were to attempt to reverse this process that is working so nicely now, we would merely delay the game.

### Maintenance a Better Word Than Service

Now I want to mention some specific points made by Ruthenberg. He says that the word "service" has been terribly abused, but that he knows of no better word. "Maintenance" is a better word and has been adopted by a great many dealers and distributors. They are even going so far as to carve this word in the stones at the handsome portals of their maintenance establishments. Service is being relegated to its proper place wherein it means exactly what service does in any other merchandising establishment. It means proper delivery of the car; proper care of the car under guarantee; adjustment of tappets and other things which are supposed to be done without cost to the new owner.

Again, Ruthenberg says that dealers are not the far-sighted men of the factories. I would challenge this and ask if anybody can consider for a moment dealer establishments like Packard, or the Oakland, in New York; the Hudson establishments in Chicago and St. Louis; the Buick dealer establishment in St. Louis; the Pence establishment in Minneapolis, and many others that could be named, and say that the problem of running these establishments is not akin to that of running a factory. Also, that the men who invested millions in these plants were not far-sighted.

It is quite a different proposition of building a factory and manufacturing or assembling one article and turning it out day after day, and that of building an establishment where from 100 to 300 different jobs are handled each day—no two exactly alike. There are no rotation jobs in these maintenance establishments for the dull-witted men who learn which lever to pull at a certain time, but they must be men who are always working, intelligent, and guided by what they can see in the job ahead of them. It is a different line of craftsmanship, and, in our opinion, a very superior line to that of factory workmanship.

### Indictment Not Just

We will not deny that Ruthenberg's indictment of the maintenance industry might have been very just five years or more ago, but today it is not a just one, and this pro-

test is made in the names of the dealers who are building the proper kind of establishments, who are buying the right kind of equipment, and who are selling maintenance with an equal zest with cars, and it is a plea for the recognition of the business ability in the dealer field which has made possible the employment of men like Ruthenberg to make for better production.

I would just remind that in a later article in **AUTOMOTIVE INDUSTRIES** (March 29) Ruthenberg tells how in a factory under his control the effort for better production was begun by taking the foremen into consultation and letting them build their own system, a system which brought about wonderful reforms and a greatly lessened cost of production. I believe that what is good for Peter is also good for Paul, and that the same general plan of operation will work among dealers. I do not believe that there is a factory service manager in the world who can go to dealers and tell them to do this or that with any more success than Ruthenberg could go to his foremen and tell them to do this or that. I believe it is necessary to let dealers work out their own salvation under the conditions which exist.

CLYDE JENNINGS,  
Editor, **Motor Age**.

### Plan International Competition

**A**N international competition for motor trucks operated by producer gas generated in gas producers installed on the trucks will be held starting Oct. 1, 1923, says Consul E. L. Ives, Paris, in a report to the Department of Commerce. This competition is being organized by the French National Bureau of Inventions and Researches in cooperation with the Technical Departments of the Ministry of War.

The competition will include shop, road and endurance tests, and will be open only to trucks carrying a load of 3500 to 5000 kilograms. They must be especially built for the use of lean gas, either with special motors or ordinary motors suitably transformed and must be built to utilize gasoline as an emergency fuel. Charcoal and wood are specified as the only combustibles for these tests.

Entries will be received until July 1, 1923, at the "Commission Technique" of the "Automobile Club de France," Paris, where detailed programs and schedules may be secured.

**M**OST of the metals commonly used in solders, except magnesium, are electro-positive to aluminum, so that any metals used in making a soldered joint of aluminum act electrolytically in the presence of moisture as positive galvanic poles accelerating the corrosion of the aluminum.

This information is given in Circular No. 78 of the Bureau of Standards, entitled "Solders for Aluminum."

Magnesium cannot be utilized advantageously even though it is electro-negative to aluminum because the metal disintegrates rapidly in the presence of moisture. Therefore, soldered joints of aluminum which are to be exposed to moisture should be protected against corrosion by paint or varnish. Various compositions of zinc-tin and zinc-tin-aluminum solders give the best results.

The tensile strength of a good aluminum solder is about 7000 lb. per sq. in., because those with higher tensile strength usually have such a high temperature of complete liquidation that they are unsuited for soldering purposes. As a rule, the strength of an aluminum soldered joint depends upon the type and workmanship.

# Sound Purchasing Policy Permits Saving in Production Costs

Averaging prices on fluctuating market often more economical than buying in quantity at particular point. Analysis needed to eliminate speculative judgment. Contracts should allow supplier to operate efficiently. Importance of stable supply.

By Harry Tipper

**T**HESE articles have pointed out a number of times the fact that direct labor costs in manufacturing are of minor importance in the total manufacturing cost.

Both materials and factory overhead are of more importance, because they occupy a large area of the total cost and influence more directly the fluctuations of profit or price.

Purchasing, as an important part of the factory operation, has received a good deal of attention and the conditions require its systematic consideration; at the same time the multitude of items required in the work of manufacture, for the product, the equipment, and the supplies of the factory, call for a considerable amount of speculative judgment in the matter of contract, delivering, inventory and sources of supply.

The object of organized purchasing is to provide the required items continuously at the smallest cost, considering price, necessary inventory and capital employed. This object demands the analysis of

- Sources of supply
- Quality of product
- Uniformity of product
- Contracts
- Prices
- Relation between price of product and the cost of capital tied up in the material
- Fixed charge variation involved in inventory variation

Many of the products required for manufacturing purposes in the automotive field vary greatly in the price and availability over a production period.

It is necessary for the product to be ordered for a considerable period ahead and the judgment of how the amount of inventory, the price and the cost of the frozen capital shall be considered demands a keen knowledge of market conditions and prospective movements.

It is obvious that continuity of supply is one of the most important factors in the purchase of all materials and supplies. The cost of an idle factory is greater than a considerable variation in price for a required material, even if the difficulty last only a short time. The additional inventory required to safeguard any uncertainty as to continuity adds considerably to the cost of the material by increasing the fixed charges.

If the time requirement for progress from raw material

to completed article is two months, then the ideal factory condition would demand an inventory as close to this as possible. Fluctuating markets, however, exert their influence upon the price of the material and, as a consequence, careful judgment is required as to the relation between contract and open market buying, or between contract and delivery.

Scarcity of product in prospect demands the consideration of more rapid accumulation of inventory in order to safeguard the production, while, of course, when suppliers are asking for releases the inventory can be cut down much closer to the minimum.

There is a tendency, however, to overemphasize both of these conditions, so that the inventory becomes excessive in amount and cost in face of a prospective shortage, and becomes small enough to be costly from insufficiency when materials are seeking delivery.

The premiums paid for delivery of material in 1920, which was not used for a year afterward, is an illustration of this point, while the shortage of product on close buying in 1922 is an illustration of the opposite condition.

The manufacturer in his purchases is dependent for his costs, to some extent, upon the maintenance of reasonable manufacturing conditions among the suppliers of his material.

Where the supplier of parts or materials cannot be assured of any market beyond the immediate delivery order, he is unable to work on the most economical basis in his own manufacturing operations and purchasing.

Sooner or later, the buyer pays all the costs of the seller in one form or another and both stability of supply and cost of supply are affected adversely by uncertain buying.

This necessity for future stability of market on the part of the supplier is met by contract buying, which is the usual basis for all the more important items.

Contract purchase enables the manufacturing establishments on both sides to stabilize the operations so that they are not subject to the costly uncertainties involved in open market purchases.

Contracts, however, carry a mutual obligation and are valueless unless this mutual obligation is just and workable. This type of contract in the automotive field

**M**ATERIAL purchasing is a subject of particular interest at the present moment. Market fluctuations are such as to require an inordinate amount of speculative judgment and consequently manufacturing costs are subject to great uncertainty.

Harry Tipper points out, in this article, the great importance of having a sound purchasing policy developed in connection with the entire factory program. He shows where mistakes in judgment are liable to be made and tells where further analysis is needed to help keep down manufacturing costs.



is still subject to a good many onerous conditions in many cases, which make the supply more uncertain and doubtful. Some contracts have been offered and made carrying a ten-day clause against the supplier with no similar condition on the other side.

Of course, a contract of this kind does not fulfill the purposes of a contract as it does not enable any supplier to deal with his manufacturing on any other than an extremely speculative basis and larger cost. The stability of supply is affected adversely by such contractual conditions.

### Price Must Be Weighed with Other Factors

The price paid for any material is of great importance, but it is strictly relative to the stability of the supply, the fluctuation of inventory and the character of the product.

Specifications will not insure a suitable product in themselves, the uniformity and character of material are affected by the type of policy of the organization just as every other manufacturing operation is affected.

Rejections of material, reshipments, additional inspections and tests add their cost to the actual factory cost of the material itself and affect the saving theoretically secured by price differences.

Price reductions offered for large quantity deliveries may be offset by the increase in fixed charges due to the additional requirement of capital, space and overhead.

Averaging prices on a rising market or a descending market may prove more valuable in minimizing costs than the buying of larger quantities on a particular point in the scale.

All these items affect either the terms of the contract themselves or the relation between the contract and open market purchases. They are in turn affected in analysis by the capital involved, the rate of turnover and the fluctuation in fixed charges.

The analysis of purchasing should take in at all times the careful consideration of the desirability of diversity in the sources of supply.

Manufacturers are giving more attention to this matter than formerly, but it is capable of much further analysis. Many causes of delay are contingent in industry upon factors partly or wholly outside the control of the individual manufacturer. Congestion in transportation, local scarcity of labor, variation in quality of skilled help, delays of material to the supplier, and so forth, are all important possible difficulties in the continuous supply of material from any source.

### Diversity of Supply Important

None of these are entirely under the control of the individual manufacturer supplying the automotive field. Economically, also, the cost of materials is likely to be kept to a reasonable basis, where there are a reasonable number of available sources of supply.

This is true not because of the competitive situation, so much, but because the cost methods of manufacture and costs of operation show a wider difference where the number of establishments is greater. There is more experimentation, more initiative and, consequently, a more rapid pace of improvement. This is not always the case, but with much of the material involved, the question of diversity in the sources of supply is sufficiently important to warrant analysis.

Where the present sources of supply are insufficient or too uncertain, it is the job of purchasing to develop new sources or stabilize present ones by analysis of the conditions.

Consequently, the purchasing branch should be acquainted with more sources than are required at the

present time by the value of such sources to the manufacturer.

The relation between fixed charges, inventory capital and purchase price has not been sufficiently analyzed. The price variation is emphasized unduly. The price advantage is an important one, on all items where the purchases are large; but the cost of the required capital and fixed charges in relation to quantity and turnover should be considered before the net advantage of buying on price fluctuations can be determined thoroughly.

The continuous supply of material at the lowest possible safe inventory is a matter to be kept in mind. Where advantage in price suggests the increase in inventory, the advantage in price must more than offset the cost due to the tying up of the extra capital for a longer period. Where the scarcity of material demands a larger safety factor in inventory, the immediate prospective market for product must fully justify the additional quantity, both from the standpoint of volume and profit on that production.

### Large Opportunity for Saving

The purchasing of material and supplies is a special branch in its operations, but in the consideration of policy it must be a major job of manufacturing, studied from all the requirements of the factory. It involves considerable opportunity for saving on capital charges, loans and fixed expenses.

It involves the stability, safety and continuity of products and it affects the entire cost of production to a considerable degree, so that the actions taken in purchasing require the development of a definite policy in connection with the whole factory program.

LAST September the French Minister of Public Works appointed a committee to report on the advantages of motor railcars on local railway lines where the number of trains has to be reduced on account of the unprofitable character of the service.

The committee has carried out tests with two kinds of motor cars, one of light construction with a 25-30 hp. engine for use on narrow gage railways, and the other a heavier type, capable of hauling an ordinary railway car when the traffic is heavy.

It was found that the total cost of running the light motor car with a trailer was 1.14 franc per kilometer, and that of the heavier car alone, 1.30 franc per kilometer. On the narrow gage lines the cost of running trains by steam locomotives is 2.25 francs per kilometer, so that the use of a gasoline motor car cuts the cost practically in half.

A DESCRIPTION of the source, manufacture, uses, and common methods of testing shellac is given in the Bureau of Standards Technologic Paper No. 232.

It is shown that the generally accepted iodine value method for determining rosin in flake shellac may be subject to very large errors, and this method cannot be applied to cut shellac.

The amount of material soluble in a light petroleum distillate and the acid number of this material are shown to be quite constant for pure shellac, and a method of determining adulteration both by rosin and other substances which can be as easily applied to cut shellac as to flake shellac has been developed. Suggested specifications for pure orange flake shellac and orange shellac varnish are given.

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## Another Smoke Screen?

**A**N element of grim humor is to be found in the fact that President Pearson of the New Haven Railroad complains, in his annual report to the stockholders, that motor trucks have been able to take business away from the railroads because they receive a "subsidy" at the general expense.

The New Haven is suffering from the sins of its fathers, and we admit a feeling of pity for the stockholders, especially the little ones. Years ago they reposed too much confidence in men who were more interested in speculation, stock juggling and politics than in operating a railroad.

Up to the time the Government stepped in with its anti-trust suit against the New Haven and compelled an operating reorganization, there wasn't much of anything in the way of special privilege or subsidy which it didn't enjoy in the States it dominated.

It was these things rather than motor truck compe-

tition which put the New Haven on the rocks. Pearson must be throwing up a smoke screen, therefore, or he must think his stockholders have mighty short memories.

Motor trucks have made considerable inroads on the short haul less than carload lot freight which went to the New Haven when there was no other means of transportation. The fundamental cause, however, was the poor service given by the railroad.

Pearson's argument about a "subsidy" is the familiar, bewhiskered howl of the railroads that trucks use the common highways without paying an adequate tax, while the railroads have to pay for their right of way and bear a heavy tax burden. It is too familiar and too foolish to need discussion.

## Caution Signals Heeded

**C**URRENT trade reviews, such as Bradstreet's and Dun's, report a distinct pause in new buying in the past ten days. Production continues at a high level, however, and most industries are giving attention to filling orders on their books rather than going after new business.

"There is an unmistakable trend toward caution in different branches of business and a tendency to guard against speculative excesses," says Dun's Review. "This is a reassuring phase and it also is a favorable sign that the advance in prices has slackened."

If the tendency toward inflation has been checked, even temporarily, it is indeed reassuring. Caution at this time will do more than anything else to prolong prosperity. It is as essential when factories are operating at capacity as when they are running at low levels.

## Standardized Gearshifts

**A**T least three arrangements of three-speed gearshifts are in general use in this country today on cars made in large quantities. Each type involves different motions on the part of the operator in changing gears.

The need for a single arrangement was appreciated years ago when the Society of Automotive Engineers recommended a standard three-speed gearshift which involved the following motions: Reverse, forward left; low, rear left; intermediate, forward right, and high, rear right.

Arguments for other arrangements are often made and it may be that they are preferable to this particular standard. If so, the standard should be changed. In any case, the present variation in practice results in much confusion and annoyance, if not in occasional accidents, in the operation of various cars by the same individual.

In these days when thousands of individuals own and operate two or more cars, standard practice in respect to controls is of greater importance than ever. It is not uncommon to hear of sales lost because of difference in controls.



## Too Liberal Credit Terms Liable to Stir Up Trouble for the Future

**E**NORMOUS sales of automobiles in the past year have led to many speculations as to whether a new class of buyers has come into the market. Bewilderment at the breadth of the demand is not surprising, but it would be difficult to find any great cross section of the American public which has been buying motor cars for the first time.

One important factor has had much to do with the amazing business, especially in the past few months. Cars in the lowest price class are well within the reach of the American working man when wages are at their peak and employment plentiful, if he can buy on the deferred payment plan.

Wages have risen rapidly in the past twelve months and in some trades they have approached war-time levels. The cost of living now is only about 57 per cent more than it was before the war. As a consequence there is a considerable margin between what the worker makes and what he has to spend.

Thousands of workers have forgotten the hard times of eighteen months ago in their present prosperity and thousands of them have again come into the market for inexpensive automobiles because credit terms never were more liberal than they are today.

It undoubtedly is true that the credit facilities available for purchasing motor cars have had much to do with enlarging the number of potential purchasers. There are many thousands of persons who would find it difficult to pay cash, even for an inexpensive car, but who can make the first payment and keep abreast of the monthly instalments.

From the factory point of view, if it gets cash from its dealers for its products it may make little difference what credit terms are granted purchasers, but it is likely to make a great deal of difference to the dealer.

Wages won't stay at their present level indefinitely. They are certain to decline sooner or later. It always is true that unemployment is rife when wage scales are declining. The worker who buys a car on a year's time today, therefore, may find himself with less money in his pay envelope or even with no job at all before he is able to take up the last of his notes.

It will be recalled that when wages were at their peak a great many miners bought inexpensive cars on the time payment plan. Then came a long period of idleness and dealers in the coal regions, or the finance companies which bought the paper, found themselves with a lot of used cars on their hands.

This is the chief danger when the so-called working classes go into the automotive market in large numbers. Many present buyers of this class probably have small reserves because of the period of low wages and unemployment which began in 1920. If there should be a slowing up of trade and industry in the next few months it is probable the cars they are driving would have to be repossessed by the credit agencies which financed the sales.

Many others who have paid for their cars may find it necessary to sell them for whatever they will bring to tide themselves over a temporary period of adversity.

The cumulative effect would be a huge accumulation of used cars which would depress the prices obtainable for them and adversely affect motor vehicle dealers generally.

If a dealer's resources are tied up in used cars, he has little left with which to buy new ones, and factories will have to curtail their production or put their finished products in warehouses, thus freezing their own assets which should be kept liquid to meet emergencies.

J. D.

## Truck Building Makes Strong Move Forward

Improved Demand from Agricultural Districts Brings Advance in Schedules

NEW YORK, April 16—Increase in schedules by truck builders is featuring operations at automotive plants owing, for the most part, to a readier demand from the agricultural sections of the country. There is, also, a wholesome demand for vehicles in general industrial expansion work. Programs are being moved up toward factory capacity with makers in a few instances reporting 100 per cent production. The rapid growth in the use of the motor bus is taxing production facilities, output being restricted because of plant limitations.

The improvement in the condition of the farmer is being reflected on the tractor outlook, a pronounced upward swing being evident in this branch of the industry. Renewed interest is developing in the Southwestern States with some betterment in demand from the Northwest and Southeast. As the spring season advances a steady forward movement is looked for in tractor buying.

### Rural Demand Better for Cars

The same influences that are promoting the expansion of truck and tractor production are making themselves felt in the car manufacturing field. The demand from rural communities is one of the chief factors in keeping automobile production on a high level, with schedules closely following those of March and in the case of some of the smaller producers exceeding them.

Pressure is being exerted on manufacturers from practically all buying centers for immediate deliveries of cars. Dealers within easy distance of factories are increasing the number of driveaways and boat shipments are relieving the delivery situation somewhat. There is no marked improvement in rail movements, equipment still being inadequate to meet factory requirements. The major automobile plants, however, are finding it difficult to maintain output on a level with unprecedented retail demand.

This is due in a measure to the fact that many of the larger plants are devoting an increased percentage of manufacturing facilities to closed car production, and there is still difficulty and delay in obtaining a sufficient supply of bodies for the car output. In

## Business in Brief

NEW YORK, April 19—Industrial activity continues at a record breaking pace in most lines. The iron and steel industry and building construction broke all records in the month of March, and to date April has maintained the rate. In spite of this swelling volume of business, there is a cautious note audible, and indications are that the limit of price advances has been reached in several lines.

Labor continues scarce, and wages have been advanced in many lines, chiefly textiles and iron and steel. Considerable agitation has arisen over the labor shortage, with another attack on the immigration law by the United States Steel Corp. There is little question but that there will be difficulty in getting all the work done, which must be done, when farm help is needed.

Stormy and cold weather has retarded retail sales and generally held back farm work. Implement manufacturers are getting more orders than in the three previous years, which is a good indication. The Government reports the abandoning of large areas in the central plains States.

During the week ending March 31, car loadings aggregated 938,725 cars, an increase of 21,689 cars over the previous week and the record of the year.

Steady pressure of liquidation affected corporate shares last week. The action began against oil stocks and spread to others. As a result, the market may be said to be on firmer footing, and new highs may be recorded with more or less fluctuation.

The bond market remained quiescent. Foreign exchanges showed great irregularity due, no doubt, to speculative commitments. Call money was easier and money rates and commercial paper discounts held firm.

some sections of the country, because of local conditions, open cars retain a strong hold on public favor, but there appears to be a growing demand for the closed type of vehicle.

Scarcity of raw material, while having no perceptible effect on motor vehicle production, is proving to be a retarding factor on parts operations. Expansion of present high schedules to meet requirements of vehicle producers is prevented temporarily for this reason. Shortage of labor likewise is affecting the volume of output. Collections in this branch of the industry are uniformly good.

## Parenti Plant Sold to Small Car Maker

Original Plan Goes Through, Hanover Paying \$225,000 for Property

BUFFALO, April 16—The Hanover Motor Car Co. of Hanover, Pa., has bought at a receiver's sale the assets of the Parenti Motor Corp., paying \$225,000 for the property. A committee of stockholders which had announced its intention to buy the assets did not submit a bid. Claims against the company filed in the Federal Court total \$500,000. Eleven thousand persons invested \$3,000,000 in the Parenti Corp.

The Hanover company has made efforts to acquire this property since last June when it made its bid of \$225,000. At that time the trustee was ordered to close the deal, but objections were raised by some of the stockholders.

It is said that the Hanover company plans to build a small two-cylinder air-cooled car that will list in the neighborhood of \$250, a class that would enter into competition with motorcycles and motorcycle side-cars.

### Stockholders Fight Sale

PITTSBURGH, April 16—One hundred stockholders of the Parenti Motor Co., which is in receivership, have organized at Sharon, Pa., and will endeavor to reorganize the company. The stockholders' group is arranging to make a fight for acquisition of the automobile plant in Buffalo.

Although the plant has been sold to the Hanover Motor Car Co. of Hanover, Pa., at receiver's sale, for \$225,000, counsel for the stockholders' group has filed an appeal in the United States District Court of Buffalo.

The Hanover corporation will be unable to take possession of the plant until the court gives an opinion in the appeal.

## Westinghouse to Increase Production of Equipment

SPRINGFIELD, MASS., April 16—Manufacture of small motors continues to lead the output of the Westinghouse Electric & Manufacturing Co.'s plant here, to the number of about 40,000 a month, with automotive equipment a close second.

Placing of the new D-L type of ignition system in quantity production is expected to stimulate this class of production. An order for 10,000 of these outfits has been booked for the Paige-Detroit Motor Car Co. The department has been producing heavily on ignition devices for the Gardner Motor Co. and Gray Motor Corp.

### SPRING SALON ABANDONED

NEW YORK, April 16—The spring salon scheduled for the Hotel Commodore May 13-20 has been abandoned.



## Schwab May Direct Building of Bodies

New Plans for American Motor  
Body Corp. Provide for His  
Participation

PHILADELPHIA, April 17—Plans have been perfected for the reorganization of the American Motor Body Corp. as the Motor Body Corp., consummation depending upon the action on April 25 of the stockholders of the Hale & Kilburn Corp., which became the holding company of American Motor Body in 1920.

Charles M. Schwab, the chairman of the board of Bethlehem Steel, will become the executive head of Motor Body and supervise its management, provided the proposed plan of reorganization is accepted and he is permitted to purchase a substantial interest in the business.

### Schwab to Own 100,000 Shares

Schwab's interests, acquired by purchase, would include 100,000 shares of stock at \$1 a share and an option on 300,000 additional shares at \$10 a share at any time within three years after the acquisition by the company of the property and assets of American Motor Body.

Schwab recently became actively identified with the automotive industry through his purchase of a controlling interest in the Stutz Motor Car Co., of which he is a director.

The Motor Body Corp. has already been formed under Delaware laws to acquire the entire assets, property and good will of American Motor Body and its subsidiary, the Wadsworth Manufacturing Co. It is proposed to deliver to present stockholders of American Motor Body securities of the new corporation consisting of 6 per cent bonds, 6 per cent notes and shares of no par value one class, and with certain amounts of cash.

### Old Stock to Be Exchanged

Hale & Kilburn holds slightly less than 12 per cent of the 16,000 shares of American Motor Body class A stock, and 5 per cent of the 50,000 class B stock. Under the reorganization plan holders of class A stock will receive their pro rata share of the bonds and notes of the new corporation. Each stockholder also will receive three shares of the stock of the new corporation for one share of class A stock, except that 9646 shares of new stock will be given to Hale & Kilburn in addition to its pro rata of the 48,000 shares of new stock.

Hale & Kilburn will receive \$591,900 in principal amount of 6 per cent bonds, \$127,900 in principal amount of 6 per cent promissory notes, and \$57,646 shares of stock of Motor Body, and \$789,300 in cash in exchange for \$16,000 class A and voting trust certificates for

## Regrinding Is Important Factor in Prolonging Life of Car and Standard of Work Should Be High

By A. W. LINES

Muskegon Motor Specialties Co.

MUSKEGON, MICH., April 16.

CAR manufacturers as a whole are keenly interested in prolonging the life of the motor car in the hands of the owner. Much engineering development has been done by way of the substitution of alloy steels in place of ordinary carbon steels, together with changes and refinement in design of both engine and chassis parts to give longer life.

This work is being stressed more and more each year, as the prospective purchaser is very much alive to the rapid depreciation and consequent low resale price of his car. The responsible makers are therefore endeavoring to give to the purchaser a vehicle which will furnish him a quick and economical means of transportation and a continuity of life which will give him a satisfactory return on his investment.

The reconditioning of the engine after the car has been driven for about 10,000 miles is the primary factor in prolonging car life. The speed at which pistons travel, wears the cylinders, pistons and rings so that the maximum compression is not maintained and the engine is consequently only developing a portion of its full efficiency.

The regrinding and truing up of the worn cylinders and the installation of new pistons, rings and pins restores the engine to its full power and maximum efficiency. It is here that the manufacturers' dealer organizations can be of marked assistance in building good will both for the maker and themselves.

During the past year there have been many local companies started in the regrinding business and as a result price cutting has become prevalent especially in the larger cities. With price cutting there has come a lowering of grinding standards and a skimmed job and the car owner is made the goat.

Manufacturers know that except in the large cities there is not enough regrinding work done by dealers to warrant them in maintaining their own equipment. Community regrinders take care of the requirements of all the dealers and if encouraged and supported properly do work that redounds to the credit of the car and dealer.

The work of the regrinder is very much up to the car dealer. By sending his cylinder blocks to responsible grinders, even though the cost be slightly higher per hole, he can eliminate the irresponsible setting up to do this work and put the business on a sound and satisfactory basis.

Regrinders are forming organizations of their own in several of the large cities to eliminate the "gyp" and price cutter, and to maintain a high standard of machine-work and cylinder grinding. These grinder associations are worthy of highest support from manufacturers through their dealers.

Another factor in prolonging the life of the car by regrinding and reconditioning the engine is the effect upon the used car market. The original owner will realize more on trade-ins and the new buyer will have more confidence in the used car and will pay more for it. The depreciation rate will be materially cut because the life of the car is greatly increased.

50,000 shares of class B stock, of American Motor Body.

American Motor Body on December 31, 1920, had \$18,460,200 stock outstanding, of which Hale and Kilburn owned \$1,850,000. The total assets and liabilities of American Motor Body exceed \$22,000,000.

### EMPLOYEES ADVISE FORD

DETROIT, April 13—Ford Motor Co. will close an employee's contest at the Hamilton wheel plant on April 16, the purpose of which is to discover a means of salvaging the 90,000 small ends of spokes left over daily. These butts are of hickory and vary in length from three-fourths of an inch to an inch. The company believes that these can be converted into some useful article.

## France to Have Contest for Trucks in October

PARIS, April 6 (by mail)—A French Government competition for motor trucks operating with producer gas plants will be held from Oct. 1, 1923, and will comprise bench and road tests under the control of the Automobile Club of France. The competition is open only to trucks of 3½ and 5 tons' capacity, with a tolerance each way of 10 per cent.

To avoid a repetition of last year's incidents, when imperfectly prepared trucks were presented, it is stipulated that only engines will be admitted which have been specially designed for running on producer gas, or have been modified for this fuel. Gasoline must be considered as an emergency fuel.

## First Quarter Pays Franklin Dividend

Earnings Sufficient to Meet Preferred Requirements for Entire Year

SYRACUSE, N. Y., April 16—In a letter sent to stockholders, H. H. Franklin, president of the H. H. Franklin Manufacturing Co., reports that profits for the first quarter of the year were more than sufficient to cover the preferred dividend for the entire year.

The consolidated balance sheet of the company and its subsidiaries for the year ending Dec. 31, 1922, places current assets at \$7,714,829, and current liabilities at \$3,025,581, a ratio of 2.5 to 1. A reserve of \$3,459,508 has been established against depreciation of fixed assets, doubtful accounts, inventory adjustments and sundry purposes. The merchandise value has been placed conservatively at \$5,635,963. Fixed assets are shown to be \$10,230,341, and accounts and notes receivable, \$515,401.

The liabilities include accounts and notes payable of \$2,868,075, and equity of minority stockholders in the Franklin Die-Casting Co., of \$35,868.

Cash is given as \$1,101,673 and sight drafts against bills of lading, \$456,077. Patents and good-will are placed at a nominal value of \$1. The report shows taxes for the year of \$90,140. The capital account is \$12,559,192.

In his statement to the stockholders Franklin says:

In my letter to stockholders of Nov. 7, 1922, I made mention of plans for increasing the output and the indication for larger sales and earnings in 1923. I am glad to tell you these conditions are being met.

At the present rate of production, our output for the first six months will exceed 7000 cars and the outlook for the balance of the year is good. Profits for the first three months are more than sufficient to cover the preferred dividend for the entire year.

## Swayne to Discuss Motor Transport at Convention

WASHINGTON, April 16—Each of the chairmen of the five special committees of the Transportation Conference, which is being conducted under the auspices of the Chamber of Commerce of the United States and which will have its inning May 9, during the annual meeting of the chamber in New York, will talk on the particular subject assigned to his committee.

In accordance with this schedule, A. H. Swayne, vice-president of the General Motors Corp., will discuss "Relation of Highways and Motor Transport to Other Transportation Agencies"; George A. Post, president of the Hudson River Bridge Corp. of New York, "Governmental Relation to Transportation"; Fred A. Delano, formerly a member of the Federal Reserve Board, "Readjustment of Relative Freight Rate Sched-

ules"; W. L. Clause, chairman of the board of the Pittsburgh Plate Glass Co., "Development of Waterways and Coordination of Rail and Waterway Service," and Carl R. Gray, president of the Union Pacific Railroad, who will be chairman of both transportation group meetings, "Railroad Consolidations."

## Drake to Speak on Exports

WASHINGTON, April 17—Causes behind the rise of the automobile to the sixth place among exported commodities will be explained to the foreign commerce group at the meeting of the Chamber of Commerce of the United States in New York on May 9 by J. Walter Drake, chairman of the board of directors of the Hupp Motor Car Corp., and a director of the National Automobile Chamber of Commerce.

Activities of the N. A. C. C. in assisting the development of export business and plans for a continuation of that work will be included in Drake's address.

## Maxwell Builds New Sedan on Its Standard Chassis

DETROIT, April 16—Maxwell Motor Corp. has added to its line a new sedan on the standard chassis, differing from the regular model by the addition of many items of special equipment and special finish, and priced at \$1,625, Detroit.

The principal features are a rear trunk, two bar luggage rail on the roof with wood slats to protect the roof fabric, and spare tire carrier at the front. The car is finished in a new shade of gray-green with emerald green trim at the windows and an emerald stripe about the body below the belt. Metal trim is in nickel. Interior upholstery is of gray-green mohair with moldings and fittings in walnut.

## Case Reports European Demand Still Limited

RACINE, WIS., April 16—Reports showing that the J. I. Case T. M. Co. of Racine, Wis., has reached an output varying between 125 and 150 traction units, gas and steam, and separators daily featured the statements made to the stockholders at the annual meeting. About two trainloads of products, including Case cars are being shipped each week to foreign countries, principally to Australia and South America. A small quantity is going to Europe, but generally speaking, this demand is as yet very limited, largely owing to unsettled financial conditions.

C. J. McIntosh and William E. Black of Milwaukee were elected to the board of directors. Milton H. Pettit, for seven years a director and vice-president in charge of all production, resigned April 15 to become associated with the Simmons Co., Kenosha, as vice-president in charge of its main works in Kenosha. His duties are being distributed among other executives.

## Cab Company Begins Invasion of Europe

Operating and Sales Organizations Provided in Yellow's Arrangements

NEW YORK, April 16—The Yellow Cab Manufacturing Co. has begun an invasion of Europe which will include the establishment of sales organizations in England and France, together with operating companies in London and in important Continental cities. Cab bodies will be built in England and France. Study of manufacturing costs in these countries is contemplated with a view to producing certain parts there if economies can be effected by such a method.

Advantageous credit facilities are being extended to foreign buyers, and a special engine with small piston replacement has been developed for use in exported cabs. Operating engineers are being sent out to help organize and properly establish the operating companies which will be formed in London, Paris, Madrid, Bordeaux, Lisbon and Copenhagen. The American company will have no financial interest in the foreign operating companies.

## Europe Formerly Advised America

Eight years ago John Hertz, president of the Yellow Cab Manufacturing Co., went to Europe to find out why taxicab companies over there were more successful than those in the United States. He brought back many ideas and incorporated them in his efforts to develop the taxicab in this country. Having built up the largest taxicab manufacturing business in the world, his company is now in a position to give new ideas to foreign organizations.

Gordon Lee, foreign sales manager, left for Europe last Saturday for the purpose of organizing the London and Paris operating companies.

Cabs will be sold to foreign operating companies for a cash payment covering only duty, taxes, shipping costs, etc., the balance to be paid within four years. Similar credit arrangements already have been extended to cab operators in Canada. Foreign shipments will consist of a single landaulet model, the price of which is \$1,950, f.o.b. New York.

## MOLINE TRUCK PLANS BURNED

EAST MOLINE, ILL., April 16—Patterns and plans for a one-ton truck being developed by the Moline Plow Co. were lost in a fire which last week destroyed the experimental building of the truck works in this city.

## NASH REPORTS BIG QUARTER

KENOSHA, WIS., April 16—Nash Motors Co. reports that factory shipments from Jan. 1 to April 9 exceeded the total combined shipments for the first five months of 1922.



## Part of Former Site Sold by C. G. Spring

**Rest of Location for Sale—Company Working at Capacity in New Plant**

KALAMAZOO, MICH., April 16—Any possibility that the C. G. Spring Co. will rebuild on the site of the plant destroyed by fire, the latter part of March, has been dispelled by the sale of the rear portion of the land area to the Consumers' Power Co. Approximately \$40,000 was received for 65,000 sq. ft. of land. The front portion, 249 by 148 ft., largely covered by a two-story brick building, also will be sold.

In the meantime the concern started production at full capacity this morning in the factory leased from the Dunkley company. Christian Girl, president, reports that practically all of the former factory force are back at work, and that he will have 350 to 400 men employed by the end of the week.

The new factory is a great improvement over the old, being a new building of the best type of construction. The equipment has been increased by the purchase of a number of presses and furnaces, which will materially increase the output of the Kalamazoo division. Crude oil storage tanks, capable of holding 60,000 gallons, or a month's supply, are being erected.

Girl states that despite the fire, which cut off all production for the last week of March, \$330,000 of finished products were shipped that month.

He has also been able to increase greatly the capacity of the units at Chelsea, Mich., Detroit, Cleveland and Chicago.

## Rome Conference Favors Adequate Road Programs

NEW YORK, April 16—Resolutions recognizing the importance of adequate international highway programs were adopted by the International Chamber of Commerce at its recent session in Rome.

A. J. Brosseau and J. Walter Drake represented the National Automobile Chamber of Commerce at the sessions. The resolutions passed are as follows:

Whereas the motor transport of goods and passengers has become one of the great transportation factors in trade and commerce, and the construction and improvement of national highways is vital to a well-balanced system of transportation, therefore be it resolved:

1. That the construction of national highways for national purposes be fostered and international transportation thereupon be encouraged;

2. That in the construction of national highways systems there be taken into consideration their connection with highways of contiguous countries so that trunk lines for motor transport crossing national frontiers may be available;

3. That the laws and regulations applying to motor transport across national boundaries be simplified and unified;

4. That the rules and regulations governing the type, construction, equipment and operation of motor vehicles in highway transport be also simplified and unified in order to eliminate discrimination and needless delay;

5. That the finance of these roads is a matter for the separate consideration of each nation.

## "Doughnut" Tires Coming, Rickenbacker Prophesies

DETROIT, April 16—In a prophetic mood, E. V. Rickenbacker declares that the automobile of two years hence will be fitted with "doughnut" tires, practically eliminating the wheel; will have four-wheel brakes and smaller engines. The use of the big casing, he thinks, will mean that the large tire will be placed on the hub and brake rim, which probably will be integral, and that steel wheels—if the remnant that will remain can be called a wheel—will be universally used. In the way of power plants, he names the four, six and eight, all in a line.

His further prediction follows:

All closed cars carrying more than four passengers will have four doors. The two-door type already has run its course. Even its cheapness did not justify it or compensate for its inconvenience. This is best proved by the experience of Henry Ford, who makes the cheapest sedan and who heretofore has been a law unto himself. He was forced by demand to put four doors on his sedan. This is one of the few times he was forced by demand to change his course.

## Sanders's Work with Cole Will Cover All Country

INDIANAPOLIS, April 16—L. B. Sanders, who recently resigned as secretary of the Boston Used Car Statistical Bureau to join the merchandising organization of the Cole Motor Car Co., will not confine his activities to New England, but will conduct educational work for Cole throughout the United States.

As a result of his experience as a distributor and dealer of passenger cars, followed by his work with the Boston bureau, Sanders has developed ideas regarding the handling of used cars which fit in with the Cole policy. When Cole recently reduced its prices and its dealer discounts simultaneously, it announced a no-trading policy for its dealers, most of whom are now handling used cars only as agents for the people who turn them in against new cars. Sanders believes that the only solution for dealers on the used car question is to quit trading used cars, that is to stop handling them entirely or to take them on consignment or on actual purchase in the transaction entirely separate from the sale of the new car.

## GARDNER'S MONTHLY GAIN

ST. LOUIS, April 16—Gardner Motor Co. reports that it increased its production 407 per cent in January over the same month in 1922; 480 per cent in February and will top March, 1922, by more than 227 per cent.

## Mexico Will Reduce Duty on Some Items

**Repair Parts and Tires Will Feel Effect of Action by President Obregon**

MEXICO CITY, April 7 (By mail)—Reduction of the present high duties on automobile repair parts and tires is expected within a comparatively short time. President Obregon, on April 5, promised a committee of "camioneros"—as the bus and cab drivers are known here—that immediate steps would be taken to assist them by bringing down the tariff charges.

What is expected is that the government will reduce by 25 or perhaps 50 per cent the recently imposed duty on pneumatic tires of two pesos per kilo. This will be on tires within a certain weight limitation, probably 20 or 25 pounds.

## Tire Duties Increased Feb. 15

By presidential decree, on Jan. 24, which became effective Feb. 15, the tariff on pneumatic automobile tires was increased from one peso to two pesos and on pneumatic and solid truck tires from one-half peso to two pesos per kilo. A general advance in tire prices became effective on March 1. The consequence was many and varied protests, the largest and most effective being a demonstration by several hundred bus and taxicab drivers.

The increase, it is calculated, is equivalent to an assessment of practically 90 per cent on the American wholesale tire value, in duties, on Ford sized tires, and practically 75 per cent on cord tires of the larger sizes.

The higher duties on automobile parts became effective Feb. 28, the old duty of 30 cents (Mexican) per kilo being increased to 1.50 pesos. Ford springs, which formerly sold for 15 pesos, now pay 27 pesos in duty alone. A Buick rear spring, for instance, now pays 81 pesos duty against an old duty of about 15 pesos.

## Car Owners Pay Price

The burden of these higher prices, of course, has fallen upon the thousands of automobile owners in all parts of the Republic. It is estimated that 15,000 automobiles or more are in use in the Federal District alone, and that in Mexico City there are from 4000 to 5000 taxicabs and buses, mostly of the smaller sizes, the owners of which are being forced to pay greatly increased prices for tires and parts. At least 10,000 drivers, conductors and automotive workers in the Federal District are directly affected by the higher duties, and they have made the most vigorous protests. The result is that the government is expected to give immediate attention, perhaps within the next week or two, to reducing the duties.

## Day's Output Record Broken by Goodyear

Accomplished April 13 with  
Fewer Men Employed Than  
Three Years Ago

AKRON, April 16—All tire production records were shattered on Friday, April 13, when the Akron, California and Canadian factories of the Goodyear Tire & Rubber Co. turned out a total of 64,013 completed pneumatic automobile tires in 24 hours' time.

The previous high production mark was 35,780 tires, made by the Akron Goodyear factories three years ago or on April 14, 1920.

The records of April 13 of this year, however, show that the Akron Goodyear factories themselves eclipsed this record, producing 48,592 tires. The Goodyear Canadian factory turned out 6584 tires the same day and the California plant 8837.

### March Output 1,029,797 Tires

Goodyear production records for March show 1,029,797 tires produced as compared with 910,714 in March of 1920. The Akron factories alone made 800,526 tires last month as compared with 842,795 in March, 1920, while the Canadian plant made 129,039 tires last month as compared with 67,919 tires in March, three years ago. The California plant, which started operations in June, 1920, turned out 127,232 tires last month.

Goodyear officials say that the production record of March is significant in view of the fact that while it took an average of 31,000 men at the Akron plant to turn out 842,795 tires in March, 1920, it took less than half as many men, or 14,950, to turn out 927,758 tires in the Akron and California plants last month.

### Employees Are Experienced

Commenting upon this increased production with smaller man power, Vice-President P. W. Litchfield says:

In 1920 there was a shortage of labor and a shortage of houses in Akron, resulting in a heavy turnover. The bulk of this turnover came in the first few months of a man's employment. Consequently there was always a large number of new men working in the factories who, because of their inexperience, pulled down the average output per man, and required a large number of men to spend their time on supervision and instruction work.

The great majority of our men today, on the other hand, are experienced men, thousands of them having five or more years' service with the company. They are men experienced on the particular operation on which they are engaged. The number of men needed for supervision and instruction has been cut down.

In addition, the urgent necessities of the past two and a half years have forced the most rigorous re-studying of every operation in the plant and the adoption of every possible improvement in machinery, in processing, in methods of manufacture, in assembly and dispatch of materials.

## M. A. M. A. INDORSES RAIL SAFETY EFFORTS

NEW YORK, April 16—Cooperating with the "careful crossing campaign" launched by the American Railway Association, directors of the Motor and Accessory Manufacturers Association have adopted a resolution that "this association places itself on record as approving the efforts of the American Railway Association to encourage travelers upon the highway, particularly those using automobiles, to exercise a high degree of care at railroad-highway intersections and this association urges upon its membership wholehearted personal cooperation in discouraging reckless disregard of danger at such crossings."

Every short cut which would reduce the cost without impairment of the quality has been taken advantage of.

This saving has been passed on promptly to the public. The fact that tire prices up to four months ago were 50 per cent below the peak of 1920, and with the recent advances are still 43 per cent under, is the result, it is true, of lower prices of raw materials, but it is also the result of the marked increase in efficiency of production and the cutting of factory costs.

## Propaganda Will Stress Economic Value of Roads

INDIANAPOLIS, April 16—The first annual convention of Allied Motor Commerce of Indiana will be held Monday, April 30. While several important papers and addresses are planned, the details have not yet been announced by Secretary S. H. Haddon or the executive committee, which is to have charge of the meeting.

The need for education of the entire State on good roads is to be considered, according to Haddon, and the executive committee hopes to have plans well worked out in order that definite good roads propaganda can be carried on during the next year. This will dwell on the economic and social value of highways and highway transport, so that citizens will not always think of road wear, upkeep and taxes every time the subject is mentioned.

## PENNSYLVANIA RUBBER ELECTS

GILLETTE, PA., April 17—In addition to reelecting all directors and officers, stockholders of the Pennsylvania Rubber Co., at the annual meeting, appointed an executive committee, made up of Charles M. Du Puy, Seneca G. Lewis, George W. Daum, James Q. Goudie and A. H. Price.

## TRAFFIC TRUCKS SENT ABROAD

PHILADELPHIA, April 16—The Traffic Motor Truck Co., St. Louis, is shipping through the port of Philadelphia twenty-five trucks for foreign points.

## Color of Paint Used May Clinch Car Sale

S. A. E. of Cleveland Told of  
Emotional Appeal Made by  
Certain Hues

CLEVELAND, April 16—Anything that appeals to the emotions will frequently act as a clincher to a sale of an automobile, Edwin Paton of the local Franklin Motor Car Co. told members of the Cleveland section of the Society of Automotive Engineers at a meeting in Hotel Winton.

Paton served as a substitute for Edward S. Jordan, president of the Jordan Motor Car Co., who had been scheduled to speak on "Color in Relation to Selling."

He emphasized the care paid to the paint job in England, reading a newspaper clipping which stated that the entire board of directors of an English railroad had spent five days in a manufacturing town debating what paint should be used on a new supply of coaches. Paton then spoke of the superiority of the painting jobs on Continental trains over those on trains in this country.

### Cites Taxicab Colors

The checker, yellow and red cabs that are used in various cities were cited as evidences of the appeal that the paint job can give to the automobile. These cabs were kept before the public constantly by the color of their paint. Whenever thousands of pedestrians think of a taxicab, he said, they think of a checker, yellow or red.

Drawing on his experience as an advertiser, Paton said that the power of color had been amply demonstrated in circular letters and cards. When he sent out a card in plain colors he received on the average about 2 per cent of replies. When he touched up the card with colors the percentage of replies rose to 15 and 20 per cent.

The speaker ventured the prediction that the automobile manufacturer who evolved a distinctive and attractive color job with utility value, would make the hit of any year in the industry.

### Communities Have Preference

Taking up his experiences as a car salesman, Paton said that he found he could not sell cars of certain colors in some New York cities. The bright colored cars would not go in the larger cities, while in the northern sections of the State where there were many villages and sparsely settled sections the bright and fanciful colored paint jobs were popular.

Paton presented the result of a survey to ascertain color desires showing that 64 per cent of those persons questioned preferred red; orange was not desired, but brown, blue, black and dark green were favored.



## Carloads of Tractors Shipped to Southwest

### Other Shipments Go Overseas— Truck Business Reported Best in Two Years

MILWAUKEE, April 16—Production of passenger cars in this territory is now at the highest rate that has ever been known; truck builders are in some instances operating at full capacity; tractor manufacturers are experiencing a real stimulation, while the manufacture of automotive units, parts and equipment actually has crossed the 100 per cent production mark by the institution of overtime schedules in most plants.

Despite this gratifying situation, the output of units, parts and equipment is below the demand, and much further expansion of production is prevented by the difficulty of securing prompt supplies of raw and finished materials and of competent labor as well.

#### Kansas City Distributing Point

While general automotive business has sustained its recent gains in the first half of April, perhaps the most conspicuous position is that of tractors. During the past week Allis-Chalmers of Milwaukee shipped two trains, or 103 carloads of tractors, to Kansas City for distribution in carlots throughout Kansas, Nebraska, Oklahoma, Missouri, Texas, New Mexico and Arkansas. Accompanying the train out of Milwaukee were sixty-nine distributors and dealers from these territories who came to Milwaukee for a district sales convention, which resulted in the orders cumulated in this record shipment.

The J. I. Case T. M. Co., Racine, Wis., has just sent away from its works a third trainload of Case tractors, passenger cars, road machinery, threshing machines, etc., all destined for foreign countries. The bulk will go to Australia, smaller portions being meant for France, Russia and England.

Factory sales of motor trucks in the past sixty days have been the largest in number in more than two years, and production is steadily approaching the peak, while several concerns are building more chassis at this time than since they were established. General freight hauling, road construction and building construction is requiring a relatively enormous number of new trucks, while the passenger bus demand is of record-breaking proportions. Inadequacy of facilities for building these types of bodies alone is limiting output of large-capacity passenger trucks.

#### Retail Demand Active

A burst of activity in Milwaukee retail demand for passenger cars has followed a decidedly favorable change in climatic conditions in the past ten days, and reserve stocks of dealers, accumulated since last fall, are being depleted by new

orders and those placed during the winter for spring delivery.

Although outside factories have made arrangements for quick transportation of cars to distributing points which are far greater than ever existed, the situation with respect to a quick supply of cars is steadily growing less favorable. The Crosby Steamship Line has added two extra boats for the Muskegon, Mich.-Milwaukee run across Lake Michigan, providing a double-daily service absorbed mostly by the passenger car trade of Michigan, northern Ohio and Indiana in the effort to get cars into the Northwest through Milwaukee and avoiding the congested Chicago gateway.

The Crosby boats are handling a large volume of Nash cars and other Wisconsin-built cars destined for eastern markets on the run to Muskegon, solving any return-load problem.

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## Southern California Sets New Registration Record

LOS ANGELES, April 16—All records for the registration of new motor vehicles were broken in southern California under dates of April 2 and 3. Eleven hundred and forty-one new passenger cars and 109 new commercial vehicles were registered on these two days.

Dealers are at loss to account for the stupendous rush of business other than by the presumption that many purchasers waited until after tax paying time to invest. This unprecedented demand means that a shortage in deliveries will follow soon and, with buying conditions opening up in other parts of the country, dealers predict that shortage in California will become acute.

Reports of probable price increases are believed to have had practically no bearing on the demand.

## March Sales in New York Advanced Above February

NEW YORK, April 17—Sales of new cars in the metropolitan district showed an increase during March, particularly in the low and medium priced models, according to the monthly sales analysis of Sherlock & Arnold.

Four cars in the low and medium priced class show sales for the first quarter of the year in excess of 1000, two of them going above the 2000 mark. Three others were above the 400 point in sales volume. This same ratio held for March.

In the higher priced class sales of one make exceeded 400 and three others 100.

The recapitulation for the quarter is as follows:

	Medium and Low Priced	High Priced
January .....	2,814	201
February .....	2,801	580
March .....	8,102	769
	13,717	1,550

These totals are compared with 10,596 and 1188 for the two classes in the corresponding period of 1922 and 5288 and 842 of 1921.

## Ford Sets New Mark in Ton Truck Sales

### Last Quarter, 41,681 Sold—Business Comes Chiefly from Commercial Centers

DETROIT, April 17—Sales of Ford one-ton trucks in the first quarter of the year totaled 41,681, a new high quarter record. Sales of trucks in March alone were 18,717, which exceeded by more than a thousand sales for the entire first quarter a year ago. The March total was 50 per cent higher than that of February. Sales to date conform with company predictions that the use of one-ton trucks will be greater this year than ever before.

Although the truck business is coming mostly from commercial centers, there is a large increase in demand from farming districts, and the company is looking for a continuing steady farm buying through the year based on the present outlook.

Production of Ford cars and trucks for domestic use reached 37,793 for the week ending April 10, exceeding that of the previous week by 1649. This sets a new record and is the first week when production was in excess of 6000 completed cars and trucks every day. In this week the lowest day was 6153 and the highest 6406.

## Ford's Name Associated with Green Bay Option

GREEN BAY, WIS., April 16—City authorities are deeply interested in rumors connecting Henry Ford with options which have been taken by unidentified interests on a large tract of land on the Bay front owned by John Marsch, Chicago railroad contractor.

While there may be a great deal of speculation involved, intimations are made that Ford wants this tract for either a blast furnace, steel mill or foundry group to serve the proposed new St. Paul plant. The Green Bay furnace or mill would take its supply of raw materials from the extensive iron ore holdings of Ford at Iron Mountain, Mich., where an immense sawmill has also been established and a body stock mill is being provided.

The report also says that Ford will buy the Green Bay & Western Railway, running directly across Wisconsin from Green Bay to St. Paul, giving the most direct route from the upper Michigan properties to St. Paul.

#### Lumber Camps Close for Season

MILWAUKEE, April 16—The Ford lumber camps near Sidnaw, Mich., closed for the season with an input of 1,500,000 ft. of logs, mostly hardwoods, which will be sawed at the Iron Mountain (Mich.) mill established by the Ford Motor Co.

## Frontenac Bankrupt with \$88,163 Debts

### Old Company Planned Reorgani- zation but Ryan Failure Pre- vented Deal

INDIANAPOLIS, April 16—Reminiscent of the days when Allan A. Ryan was a prominent factor in the automotive industry is the voluntary petition in bankruptcy filed in the Federal Court here by the Frontenac Motor Co. The petition, signed by Louis Chevrolet as president, gives the company's assets as \$425 and the liabilities \$88,163.

The company was organized in 1915 and in 1921 it was proposed to reorganize, with Ryan backing the new enterprise. The plan was to bring out a sport car selling around \$2,000 and to erect a plant in Indianapolis. The engine was one designed by Chevrolet and was displayed at the Commodore Hotel during the New York show.

One car was finished by the time of the Indianapolis race, May 30, 1922, and was shown to race visitors. Then came Ryan's financial troubles and the Fron-

tenac company was among the sufferers. All reorganization plans were given up and since then the company has been in a dormant state.

Chevrolet himself has turned his attention to building racing cars again and three of his cars will be in the Memorial Day race as the entry of the Scheel Motor Co. of St. Louis.

## Ford Produces 150 Cars Daily at New Orleans

DETROIT, April 13—The New Orleans branch of the Ford Motor Co. is now operating on a basis of 150 to 200 cars daily, following the shipping of the first car completed there March 3. About 550 men are at work. The territory embraced is the entire State of Louisiana, the southern half of Mississippi and nine counties on the southeast fringe of Alabama.

As an indication of the growth of business in this section, the company points out that the schedule for distribution in this territory this year is 40,000 cars and trucks and 3500 tractors, compared with 30,275 cars and trucks and 1411 tractors in 1922. The sales estimate in 1916, when the branch was founded, was 6194.

## All Georgia Shows Sales Improvement

### Farm Implements, Including Tractors, Selling Better Through Southeast

ATLANTA, April 16—There has been a healthy increase in automotive sales among the Atlanta dealers and distributors the past five or six weeks, with a majority of dealers reporting sales on a par with the peak period of 1920, and in many cases even in greater volume. As a whole dealers are very optimistic over the 1923 outlook and believe it will prove the largest year in sales volume the industry has ever experienced in this district.

Automotive registration figures at the State Vehicle Department indicate a healthy upward trend among dealers over the entire State, with many more licenses sold at this time than in the same period in 1922.

The last report of the Federal Reserve Bank, issued this month, covering conditions in the sixth district, which

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**Table That Shows Shipments of Products of the Automotive Industry from the United States in February, 1923, and the Total Exports That Were Made in Eight Months**

	Month of February		Eight Months Ending Feb. 28	
	1922	1923	1922	1923
	No. Value	No. Value	No. Value	No. Value
Automobiles, including chassis.....	3,560 \$2,962,135	10,568 \$7,394,747	22,892 \$20,506,229	60,656 \$44,638,657
Electric trucks and passenger cars.....	10 13,842	19 19,723b	34b 53,951	220 272,857
Motor trucks and buses, except electric (D).....	286 117,187	1,302 467,051b	2,727a 2,851,223	7,369 2,724,612
Up to 1-ton, inclusive.....	141 210,204	322 439,084b	619b 338,659	1,956 2,380,060
Over 1 and up to 2½-ton.....	27 64,347	74 186,265b	49b 123,942	467 1,327,539
Over 2½-ton.....	454 391,738	1,698 1,092,400	3,636 3,695,729	9,792 6,432,211
Total motor trucks and buses, except electric.....				
PASSENGER CARS				
Passenger cars, except electric (D).....	.....	.....a	13,708a 12,164,579	.....
Value up to \$500.....	.....	3,068 1,045,880	.....b 5,167b 1,710,117b	.....
Value up to \$800.....	1,890 958,814	2,918 1,930,058b	3,221b 1,650,320	27,342 14,381,003
Value over \$800 and up to \$2,000.....	1,096 1,217,578	2,652 2,746,044b	2,100b 2,282,457	16,683 17,821,559
Value over \$2,000.....	110 380,163	213 560,642b	193b 659,193	1,452 4,020,910
Total passenger cars, except electric.....	3,096 2,556,555	8,851 6,282,624	19,222 16,756,549	50,644 37,933,589
PARTS, ETC.				
Parts, except engines and tires (E).....	12,138,682 2,838,259	.....	19,141,490c 79,316,512c	18,618,812
Automobile unit assemblies (E).....	..... 333,133 51,445	.....	.....b 575,898b	107,801
Accessories, parts of*.....	..... 43,177,491 4,529,255	.....	.....b 65,281,104b	8,894,376
Automobile service appliances n.e.s. (E).....	..... 34,263 22,178	.....	.....b 63,203b	35,052
Station and warehouse motor trucks.....	6 11,137 26 4,055	75 87,886	90 63,918	.....
Trailers.....	26 19,230 237 99,895b	59b 40,233	548 227,547	.....
Airplanes and seaplanes.....	..... 2 5,802	19 126,165	26 335,612	.....
Parts of airplanes, except engines and tires (E).....	22,758 10,146 6,520 6,193	.....	68,104 360,884	223,598
BICYCLES, ETC.				
Bicycles and tricycles.....	237 4,783 1,879 11,208	.....	429,502 12,278	100,089
Motorcycles.....	969 259,347 1,954 444,952	5,023 1,386,762	11,175 2,627,102	.....
Parts, except tires.....	209,921 108,971 270,759 128,555b	439,839b 240,648	1,737,336 908,696	.....
INTERNAL COMBUSTION ENGINES				
Stationary and portable engines—				
Diesel and semi-Diesel.....	14 7,086 82 19,250b	21b 19,848	481 206,137	.....
Other stationary.....	1,212 168,204	..... 9,247 1,576,370c	14,729c 1,781,589	.....
Not over 8 hp.....	..... 1,968 143,590	.....	3,877b 296,324	.....
Over 8 hp.....	..... 183 76,616	.....	281b 186,478	.....
For motor trucks and buses.....	..... 5 1,171	.....	23b 9,333	.....
For passenger cars.....	..... 1,735 263,414	.....	2,753b 408,733	.....
Engines for tractors.....	..... 12 1,392	.....	29b 8,125	.....
Engines for aircraft.....	1 200 1 12,000b	4b 5,475	63 37,690	.....
Engine accessories and parts for (E).....	279,708 164,797 445,373 223,023b	949,144b 389,886	4,200,823 1,798,303	.....
All other engines and parts of.....	.....	.....	3,940,067	.....

a—July 1 to Dec. 31, 1921. b—Jan. 1 to Feb. 28. c—July 1 to Dec. 31, 1922. D—Includes electrics prior to Jan. 1, 1922. E—Pounds.



## Men of the Industry and What They Are Doing

### Brosseau Back from Rome

A. J. Brosseau, one of the representatives of the National Automobile Chamber of Commerce at the sessions in Rome of the International Chamber of Commerce, has returned home. J. Walter Drake, Brosseau's fellow delegate, is expected back by another steamer.

### H. Stuart Hotchkiss Returns

H. Stuart Hotchkiss, of the United States Rubber Co., and chairman of the special committee representing the Rubber Association of America in the Stevenson restriction act investigations, has returned from England. Hotchkiss crossed to London with the British committee which visited America and has been in close touch with that committee ever since. It is expected that he will appear before the directors of the Rubber Association and make a report on his observations.

### Dinner Given Citroen and Party

M. André Citroen was the guest of honor at a dinner tendered by Detroit automobile manufacturers at the Detroit Athletic Club. Those present were Hugh Chalmers, Charles D. Hastings, Fred J. Haynes, E. LeRoy Pelletier, Alvan Macauley, A. T. Waterfall, Burnet Hershey, Charles Sorenson, S. D. Waldon and B. G. Everitt; Messrs. Julien Kegrresse, Deloire and Dufresne of the Citroen party, John W. Staley, H. B. Joy, R. P. Joy, C. L. Redden, H. H. Emmons, Charles B. Warren, Fred J. Belanger, Charles Hughes and H. B. Griffith.

M. Citroen delivered his lecture on the crossing of the Sahara Desert by motor car before 600 members of the Detroit Section of the Society of Automotive Engineers and their guests Monday night, and on the following day demonstrated his cars, with the endless track attachment, in a selected spot on the outskirts of Detroit.

### Warrington Returns to Denby

Frank Warrington has been appointed sales manager of the Denby Motor Truck Corp. Warrington, several years ago, served as assistant sales manager and service manager of the Denby company, going from those positions to affiliate himself with the Defiance truck, following which he joined the Republic forces.

### Nash Back from Trip to Coast

C. W. Nash, president of the Nash Motors Co., has returned to the factory at Kenosha, Wis., after a four weeks' trip to the Pacific Coast, in the course of which he visited many dealers in their places of business. Among the cities he visited were Omaha, Denver, Salt Lake City, Los Angeles, San Francisco, Portland, Seattle, Vancouver, Calgary, Winnipeg and Minneapolis.

### EXECUTIVES INVITED TO GOTHENBURG SHOW

NEW YORK, April 16—A number of American automotive executives have been extended invitations to attend as guests of honor the opening of the International Automobile Exposition at Gothenburg, Sweden, on May 9.

The invitation was cabled by the exhibition committee to Henry Ford, Edsel Ford, president, Ford Motor Co.; W. Ryan, Ford export manager; A. R. Erskine, president, Studebaker Corp; H. S. Vance, Studebaker export manager; S. E. Chandler, president, Chandler Motor Car Co.; H. T. Stewart, Chandler, export manager; J. S. Woodbeck, president, Cleveland Motor Car Co., and W. S. Neal, Cleveland export manager.

### Planche Opens Own Offices

Etienne Planche, for the last nine years chief engineer of the Dotor Motor Car Co., has resigned from that position to open general consulting offices in the General Motors Building, Detroit. Planche has been connected with the automotive industry from the earliest days and is widely known in the engineering field.

### George W. Kohl Resigns

George W. Kohl, for thirteen years connected with the Zinke Co. of Chicago, has resigned as vice-president and director and in all likelihood will engage in business for himself. As a Zinke official Kohl served for the most part as western traveling representative and is widely known throughout the industry.

### Honor Paid to Jordan

Edward S. Jordan, president of the Jordan Motor Car Co. has been elected a vice-president and director of the Cleveland Chamber of Commerce.

### Westinghouse Transfers Turner

A. D. Turner, formerly with the publicity staff of the Westinghouse Electric & Manufacturing Co.'s East Pittsburgh (Pa.) plant, has been transferred to the East Springfield (Mass.) plant to manage the publicity for the automotive equipment department, succeeding J. R. Dick, who returned to East Pittsburgh.

### Cardway Represents Haynes

Colonel Fred Cardway, formerly vice-president and general manager of Packard Motors Export Corp., has been appointed director of exports for the Haynes Automobile Co., with offices at 342 Madison Avenue, New York.

## Engineers Drafting Brake Safety Code

### Need of Action Emphasized by Trend of State and Municipal Legislation

NEW YORK, April 18—With David Van Shaack, vice-president of the National Safety Council, as chairman, a special committee working under the auspices of the American Engineering Standards Committee is developing a national safety code for automobile brakes and brake testing.

The committee is made up of representatives of the American Automobile Association, Motor Vehicle Conference Committee, Conference of Motor Vehicle Administrators, American Society of Mechanical Engineers, United States Bureau of Standards, the United States War Department, Society of Automotive Engineers, Underwriters Laboratories, the Safety Group of the A. E. S. C. and David Beecroft of the Class Journal Co.

The A. E. S. C. has asked the Society of Automotive Engineers, the Bureau of Standards and the American Automobile Association to act as joint sponsors for the development of the code.

The need for a national safety code covering methods of testing brakes and also those elements of brake or brake lining construction which are accident factors is emphasized by the increasing tendency toward state and municipal legislation on this subject. Several states already have brake testing laws and in a number of other states such laws are being drafted.

### Matson with Real Estate Agency

Gilbert M. Matson, formerly vice-president and sales manager of the John Lauson Manufacturing Co., New Holstein, Wis., has become associated with the Genske Agency, real estate and insurance at Kenosha, Wis., as general sales manager. The company is undertaking important operations in connection with the development of the Nash Motors Co. and other large industries of international note in Kenosha.

### Herbig Distributes Bodies

E. T. Herbig, formerly sales promotion manager of General Motors Truck Corp., has taken over the distribution of commercial bodies for a Chicago engineering and manufacturing company.

### Fellows Heads Oakland Advertising

Waldo E. Fellows, formerly advertising manager of Columbia Motor Car Co., has been appointed advertising manager of the Oakland Motor Car Co.

## Mack Made Manager of Northway Motors

**Succeeds R. E. Northway, Who  
Disagreed with Attitude  
Adopted by Executives**

NATICK, MASS., April 17—Future policies of Northway Motors will be discussed at a meeting to be held at the factory on Tuesday, April 24, when officers and a board of directors will be elected.

President R. E. Northway, at a meeting of the trustees last Saturday, retired as manager, taking effect April 15, and John Mack was elected to the position. Northway charges his retirement was due to a request he made that H. C. Mulligan, S. W. Holmes, Frank Noyes and Reginald Heath resign as trustees because of their failure to secure the necessary financing as agreed at the time of their selection.

He also states he requested the secretary-treasurer to repudiate an agreement made with Mack about April 1, a better plan having been presented to conserve the interest of the stockholders. Northway further declares that his efforts to remove the offices to the factory from Boston at a saving of \$45,000 a year met with no response.

Northway states that the total indebtedness outstanding, exclusive of truck notes discounted, amounts to approximately \$150,000.

A letter has been sent by him to the 15,000 stockholders, requesting that they form a protective committee to conserve the business with him at the head, and to select representatives from among themselves as members of the board of trustees. In his letter asking for proxies he says Northway Motors can secure business from companies wishing to have work done at the plant.

### Stockholders in Springfield Act

SPRINGFIELD, MASS., April 17.—Three hundred stockholders of Northway Motors at a meeting here tonight voted to oppose the sale of the corporation's assets or liquidation at the meeting at the factory in Natick, April 24.

The meeting was called by R. E. Northway, who explained the situation in which the corporation was involved. He said that the outstanding liabilities of the concern amount to \$130,000 and the assets to \$1,500,000.

Sympathy was expressed with Northway's desire to retain control and prevent the company from being turned over to a corporation organized under the laws of Delaware. A stockholders' protective committee was appointed to secure proxies to be used at the meeting. Other meetings are being conducted in different parts of the State.

### ELECTRIC TRUCK SHOW JUNE 4

NEW YORK, April 17—The annual New York Electric Truck Show will be

held during the week of June 4 in the showroom of the New York Edison Co., at the same time the National Electric Light Association holds its convention. At the show there will be exhibits by all the manufacturers represented in the metropolitan territory. The convention, which will be held at the Hotel Commodore, will devote one of its sessions to electric truck discussions.

## \$15,000,000 Bond Issue Is Proposed by Overland

TOLEDO, April 18—Stockholders of the Willys-Overland Co. will be asked to authorize an issue of \$15,000,000 of first mortgage bonds bearing interest not to exceed 7 per cent at the annual meeting to be held here May 8, according to notices placed in the mails today by Secretary L. A. Miller.

The proceeds will be used to pay off the bank indebtedness, now reduced to \$10,000,000, out of notes maturing in December and to provide additional working capital. It is understood that the refinancing plan would enable the company to begin payment of back dividends on preferred stock.

The creation of the office of chairman of the board and definition of duties will also be an amendment of the code of regulations considered. Enlargement of powers of the board of directors will also be asked.

Books for transfer of preferred stock, which now has voting power, were closed April 14 and will not be opened again until May 9.

## Kissel Expanding Plant for Greater Production

HARTFORD, WIS., April 17—With Kissel production showing an increase of 300 per cent over three months ago, the company is expecting a still larger advance for the months of May and June.

The present factory expansion program is the biggest in the history of the company. The first unit, a new power house, now is in operation and plans have been made for an immediate addition, 60 by 100 ft., to the main Kissel body plant, while body plant No. 2 has been opened and is in full operation.

The Kissel dealer organization has been increased since the first of the year and the field force has been augmented.

## Hydraulic Pressed Steel Will Stay Out of Merger

CLEVELAND, April 19—President James H. Foster of the Hydraulic Pressed Steel Co. has announced: "Our directors have decided not to take part in the three-cornered consolidation of Detroit Pressed Steel, Parish & Bingham and Hydraulic Pressed Steel Co. We have made arrangements for necessary financing and will continue to operate alone."

The three companies have resources of \$30,000,000 and make automobile frames.

## J. O. Eaton Will Head Axle-Spring Merger

**Torbensen, One of Companies  
Involved, Has Bought Stand-  
ard Parts Units**

CLEVELAND, April 19—The long pending deal for the merging of the Torbensen Axle Co., the Eaton Axle Co. and the Perfection Spring and the Pontiac Spring plant, the latter a unit of Perfection Spring, has been accomplished. Bankers are working on financing plans, and when they conclude arrangements an \$8,000,000 corporation, to be known as the Eaton Axle & Spring Co., will operate the properties.

Conservative estimates place the annual business of the companies involved at \$20,000,000. J. O. Eaton, formerly a co-receiver of the Standard Parts Co. and well known in the automotive spring industry, will head the new corporation, and the same group of automotive experts who have been in charge of the various plants will remain on the staff.

### Stockholders' Consent Asked

Otis & Co., local investment bankers, today announced that Torbensen Axle, of this city, had purchased the plants of the other two concerns that figure in the merger. This was made known when it was stated that Torbensen Axle had asked its stockholders to authorize an increase in its capital stock for the purpose of taking over the other two plants.

Some time ago a syndicate headed by Howe, Snow & Bartlett, Inc., of Grand Rapids, purchased at a receiver's sale the Perfection, Eaton and Pontiac spring plants and three service stations, one at Cleveland, another at Boston and a third in New York. The Eaton plant was purchased for \$1,125,000 and the Perfection Spring plant for \$1,025,000. Since then four companies outside Cleveland interests had been bidding for the plants, but Torbensen was successful.

The combined floor space of the three companies is 573,000 sq. ft. The Torbensen plant is at East 152nd Street and the Nickel Plate tracks in this city. It makes the Torbensen internal gear drive and supplies one-sixth of all truck axles sold in the United States, exclusive of Fords, it is claimed. The Eaton plant is at East 140th Street and the New York Central Railroad here. It makes axles for passenger cars and two years ago completed a modern plant. One Perfection Spring plant is at East Sixty-fifth Street and Central Avenue, this city, and another is in Pontiac.

### HAYES MARCH EARNINGS

DETROIT, April 19—It is reported that the March earnings of the Hayes Wheel Co. approximated \$1,700,000, and that in the first three months of the year the corporation was able to establish a sufficient net income to pay its full dividend for the entire year.



## Packard 6-Cylinder Racer One-Man Car

Wheelbase Measures 100 In.—  
Three Entries Made for  
Indianapolis Event

DETROIT, April 17—The Packard Motor Car Co. will enter three six-cylinder cars in the Indianapolis race this year. The cars are now in the Detroit factory receiving their final touches before being shipped to the Indianapolis track.

Due to the fact that no mechanic will be carried, the bodies of the cars are extremely narrow and light. They are close to the 1400 lb. minimum weight limit and, according to Col. J. G. Vincent, vice-president in charge of engineering, could have been made under this weight very readily if the limitation did not exist. The engines have a bore and stroke of 2.543 by 4 in., giving a displacement of 121.89 cu. in. They are 100 in. wheelbase.

### Engine Follows Usual Design

Complete mechanical details are not available at present. It is known, however, that the general design of the engine follows accepted racing car practice with an overhead camshaft and valve action designed along lines quite similar to those of the 300 cu. in. Packards. A plate clutch and four-speed gearset are used. The gear ratios have not been settled and will not be until after trial on the tracks.

The rear axle has an aluminum center housing with forged steel tubular members. The service brakes are on the rear wheels and the hand brakes on the driveshaft. Particular attention has been given to the tire size and while the wheels are not altogether determined upon, as there are two or three sizes available, the tires are all over-capacity for the weight of the car, so that very good tire results are anticipated.

With the light weight, it is expected, of course, that fuel economy figures which will differ materially from those of the larger cars, will be secured. The tank capacities are so arranged as to require but one stop for fuel during the 500 miles.

### Drivers for Cars Selected

The drivers for the three cars will be Ralph De Palma, Joseph Boyer and Dario Resta. The cars were designed and, to some extent, built in Los Angeles. Ralph De Palma, who has previously driven Packard racing cars, was placed in charge of the branch of the Packard Engineering Department in Los Angeles where he worked under Vincent's supervision. An engineering staff was established in the Packard building in Los Angeles. A great many of the essential parts, however, were built in the Packard factory and shipped to Los Angeles.

In front appearance the cars resemble

the standard Packard product. The Packard radiator shape is utilized and blends into the stream lines of the body. The spring suspension is an unusual adaptation of the semi-elliptic. No shackles are employed. The rear end of the rear spring, for example, pivots on the rear frame cross member and at the front end the rear spring slides through a slotted member to take up the elongation due to deflection.

Colonel Vincent predicts that while the speed of the larger cars may not be equalled this year, it is his opinion that within the next two or three years Indianapolis track records will be broken by the smaller and lighter racers.

## New Anderson Bodies on Its Model 41 Chassis

ROCK HILL, S. C., April 17—Two new bodies have been added to the Model 41 Anderson chassis, these being the 41-E, five passenger sport sedan, \$1,745, and the 41-G, sport phaeton, \$1,395.

Both of these models have German silver radiator shells, disk wheels, extra tire and cover, a luggage truck containing two suitcases on the rear, bumpers front and rear and aluminum rods on the rear of the body.

The finish of the sedan is in gray and black, the chassis and running gear being black and the moldings and wheels gray.

The phaeton is fitted with green upholstery and has a green body with black fenders.

## Ford's Balance in Banks Exceeds \$200,000,000

NEW YORK, April 19—Asked by the *Wall Street Journal* as to how his cash balance stood following his investments in coal properties, timber lands, water power sites and other investments, Henry Ford replied that it still exceeded \$200,000,000 and that he has no intention or thought of borrowing any money.

## Barley Now Making New "Pennant" Cab

Does Not Resemble Its Passenger  
Cars—Deliveries Already  
Started

KALAMAZOO, MICH., April 17—The Barley Motor Car Co. has gone extensively into the manufacture of a taxicab called the "Pennant." A number of these have already been delivered to operators and are in use in some of the larger cities including New York.

The cab has been designed entirely for taxi service and does not resemble in any particular either the Roamer or Barley six passenger car. Among the special features are an 8 in. frame, boiler plate running boards and disk wheels.

A number of standard parts are used, including a Buda 4-cylinder engine, 3 $\frac{1}{2}$  x 5 $\frac{1}{2}$ , Modine radiator, Fuller 3 speed gearset, multiple disk clutch, Splitdorf aero type magneto ignition, Columbia axles, Blood Bros. universal joints and propeller shaft and a Reed steering gear which has been especially developed for taxicab service.

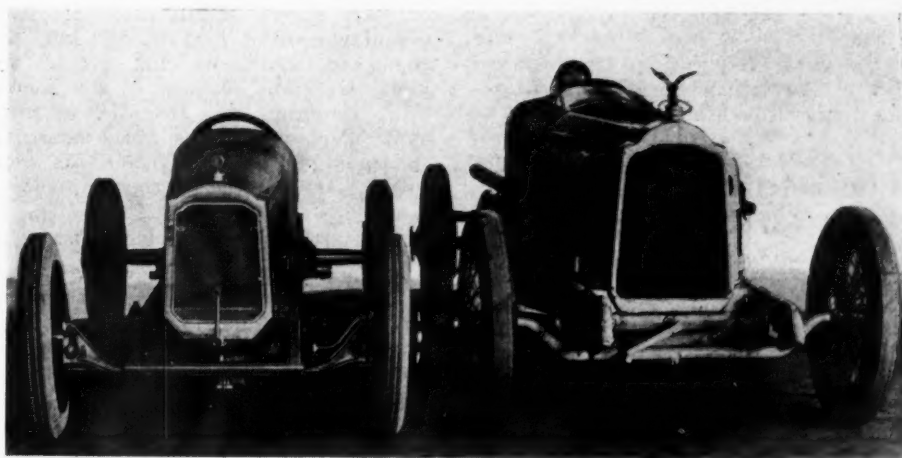
The body is made of kiln dried hard wood which is covered with a compound of creosote before being metallized with 20 gage riveted sheet steel.

## Checker Plans to Buy Mitchell Meet Failure

CHICAGO, April 16—Negotiations for the sale of the Mitchell Motors Co. plant at Racine, Wis., to the Checker Cab Manufacturing Co., have been declared abandoned.

Failure of this deal is said to have been due to the refusal of two New York bank creditors of the Mitchell company to agree to the terms proposed for the purchase of the plant.

## Packard Displays Its Indianapolis Race Car



The three Packards entered in the Indianapolis 500-mile race May 30 will be driven by De Palma, Resta and Boyer. In the illustration the 1923 121.89 cu. in. Packard racer is shown on the left and the previous Packard racer on the right, showing the difference in size by contrast

## A. S. More Appointed as Selden President

### Rumors of Possible Merger with Denby Denied Following His Selection

DETROIT, April 18—A. S. More, president of the Denby Motor Truck Co., has been selected to head the Selden Truck Corp. of Rochester, N. Y., and will take over the new connection as soon as his successor at the Denby plant can be selected. It is expected that this will be done soon, so that early in May he will be free to take his place as president of the Selden company.

Following the announcement of More's proposed change, there were rumors of a possible merging of the Selden and Denby companies, but More declares that this is gossip only. Although nominally a unit of Industrial Motors, it is understood that Selden will operate as a separate unit.

In going with Selden, More says, he has not determined upon the policies he will institute, but he declares there is a splendid opportunity in the truck field for efficiently organized companies and he plans to bring Selden to the forefront. No one will be appointed to fill the position resigned by R. H. Salmons, More says. H. T. Boulden will continue as vice-president in charge of sales, and W. C. Barry, Jr., will continue as vice-president in charge of production.

## Page and Pratt Elected to General Motors Board

WILMINGTON, Del., April 18—At the annual meeting of the stockholders of General Motors Corp., held here today, directors were reelected for the ensuing year.

To fill vacancies existing on the board John L. Pratt, vice-president of General Motors in charge of accessory companies, and DeWitt Page, president and general manager of the New Departure Manufacturing Co., were elected directors.

Following the meeting the directors left for Detroit, where a reorganization meeting will be held.

## Chevrolet Builds Cars for Indianapolis Race

INDIANAPOLIS, April 16—Louis Chevrolet, former race driver and later a builder of racing cars which have distinguished themselves in national competition, will be represented in this year's 500-mile race on the Indianapolis speedway. The entry of three Scheel-Frontenacs by the Scheel Motors Co., of St. Louis, has been made for the May 30 event, the cars now being in course of construction at Chevrolet's Indianapolis plant.

The new Frontenacs will mark a de-

parture in engineering for Chevrolet, the engines being of the rotary valve type, the two rotary valves in each engine being used for both intake and exhaust, operated at one-fourth the speed of the engine. One-man monoplane type bodies, twenty inches across in the widest place, will be used and the fuel tanks will carry supplies for 350 miles. No drivers have been nominated as yet.

## G. M. C. Buys Old Milburn Plant to Assemble Cars

TOLEDO, April 18—Development of a large assembly plant here probably will soon be undertaken following the transfer of the old Milburn property and 20 acres adjoining it to the Buick Motor Co.

Announcement that General Motors had secured the property was made by Milburn officials. Deeds have been recorded here transferring the title to the Buick company. The purchase price exceeds \$1,000,000.

Bodies will be built at the plant here and other parts shipped to Toledo from Flint.

Development of a \$10,000,000 freight terminal, yard and shops in Toledo by the Pere Marquette Railroad will provide exceptional service between this city and Flint.

## PERSONAL NOTES

### Schutte Body Appoints Herr

A. L. Herr, recently general superintendent of the Jacques Manufacturing Co. of Philadelphia, has joined the Charles Schutte Body Co. of Lancaster, Pa., in the same capacity. The Schutte company, which heretofore has confined itself to the production of individual custom-built bodies, is making radical changes in its plant with the idea of getting on a larger production basis.

### Zahrt Heads Wayne Tank Sales

W. G. Zahrt, formerly vice-president of S. F. Bowser & Co., tank and pump manufacturers of Fort Wayne, Ind., has been appointed sales manager of the pump and tank division of the Wayne Tank & Pump Co., also of that city. J. P. Porter, who has been managing the tank and pump division, has been given charge of the oil company sales.

### Lazarnick Has Cleveland Office.

Nathan Lazarnick, the veteran automotive photographer of New York, announces the opening of a branch photographic plant at 5005 Euclid Avenue, Cleveland, in charge of G. Wetzler, the White Co. requiring this service.

### Cotter Joins Western Forge

John C. Cotter, long prominent in the drop forging industry, has become an executive of the Western Drop Forge Co. of Marion, Ind.

## Duesenberg Company Sound, Court Is Told

### No Friction in Company, Officials State in Receivership Action

INDIANAPOLIS, April 18—Testimony refuting charges that the Duesenberg Automobile and Motor Co. is financially insolvent was introduced yesterday and today before Superior Judge James M. Leathers, during the hearing of a receivership suit brought by Peter A. Pfisterer, a stockholder.

After preliminary statements of counsel for both sides Tuesday, the hearing resulted in a public court audit of the books and presentation of other testimony which was not finished Wednesday afternoon.

Secretary-treasurer James McElhinney testified that about \$2,800,000 worth of preferred stock had been sold or subscribed for and that the unpaid part was in excess of \$300,000. Stock sale commissions had averaged 17 per cent instead of 30 per cent, as charged by the plaintiff, he said.

Trial balance sheets submitted by James W. Noel, attorney for the company, disclosed assets of \$1,500,000 with current unpaid bills of \$105,000, of which \$70,000 will not be due until May.

### Deficits Liquidated

Deficits due to experimental work and development of the car have been approximately liquidated by sales of new cars to the amount of \$664,000. Later testimony by Chester S. Ricker, general manager, showed that the present plant capacity is about 75 to 100 chassis a month.

The court overruled several objections by plaintiff's counsel to evidence offered by the defendant to show the financial soundness of the concern and good management. One charge made by the plaintiff's attorney that a former officer of the company had withdrawn funds due Engineer Fred. S. Duesenberg and not paid them, was flatly refuted by Duesenberg, who told the court he had received the money in conformity with the defendants' testimony.

Subsequent attempts by the plaintiff to show dissension between Fred S. Duesenberg and the management were punctured by Ricker, who testified that cordial cooperation between Duesenberg and factory officials had resulted in the present increasing production.

It is expected that the court will not arrive at a decision until late this week.

### 500 WILLS UNFILLED ORDERS

DETROIT, April 18—The Security Trust Co., receiver for C. H. Wills & Co., has been authorized to carry on the Wills-Sainte Claire business and make all necessary commitments to June 15. There are 500 unfilled orders on hand.



## Ford Purchase Plan Has Good Reception

Is Achieving Results, Reports Submitted to Sales Department Indicate

DETROIT, April 18—Reports from the sales department of the Ford Motor Co. indicate that the new weekly purchase plan is receiving a good reception everywhere. Although there are no definite figures available as to the number of persons opening specialized accounts, the movement is declared to be spreading rapidly, with the result that capacity operation of the plant undoubtedly will be insured for an indefinite period.

Some districts are reported to be more receptive to the plan than others, but this is accounted for entirely by individual dealer activity and the measure of bank cooperation. In every section, however, the plan is declared achieving results and is growing rapidly as the sales organization gets into the swing.

Bank cooperation ranges all the way from no cooperation at all in one or two scattered sections, the company reports, to a point where some banks have applied for displays of parts so that these may be installed to keep the matter before the public.

Details of the plan have been forwarded to all foreign branches and dealers with the suggestion that they make use of it as conditions warrant.

The purchase plan provides for the depositing in local banks of not less than \$5 weekly. When the savings reach a total of from \$100 to \$150, according to the model chosen, a car will be delivered, that amount constituting the initial payment. The balance of the cost of the car must be paid at the rate of \$5 weekly.

### Also Applies to Tractors

CHICAGO, April 16—The Ford weekly purchase plan has been extended to cover the purchase of Fordson tractors. Cards issued by dealers on the new plan have been made to read that any model of the Ford car or tractor can be paid for under the plan.

## Carloads of Tractors Shipped to Southwest

(Continued from page 895)

Unfortunately the opening of Great Lakes navigation, other than the all-winter routes such as the Milwaukee-Muskegon run, has been delayed four to six weeks by the extreme weather late in the winter and early this spring. Ordinarily freighters from lower lake ports like Buffalo, Cleveland, Toledo and Detroit are able to get to Milwaukee-Chicago, or Superior-Duluth, shortly after April 1.

This year ice floes at the northern ends will delay opening of navigation until May 1. The Nicholson Transit Co., De-

troit, operating three boats between Detroit and Milwaukee for passenger cars, parts, etc., is thereby seriously delayed. It is adding two ships for the 1923 season, enabling it to deliver 700 more cars each week than last year. In the meantime cross-lake service is pressed to the limit to give Detroit and Flint factories the largest possible outlet for cars to western and northwestern distributors and dealers.

## Hupp Makes Additions to Lists of All Models

DETROIT, April 18—The Hupp Motor Car Co. has increased its prices throughout. There is an increase of \$50 on the touring roadster and sport models, \$60 on the two-passenger and four-passenger coupé and \$75 on the five-passenger sedan. The new prices are as follows:

Chassis, touring and roadster, \$1,165; special roadster, \$1,265; two-passenger coupé, \$1,445; four-passenger coupé, \$1,595; five-passenger sedan, \$1,750.

The increases are not as large as the decreases made Jan. 1, so that the Hupp prices are still lower than they were at the end of 1922.

## Crawford Advances Lists of Its Open Models \$100

HAGERSTOWN, MD., April 18—The Crawford Automobile Co. announces an advance in price of \$100 on the open models of Crawford cars, the list price now being \$3,100. The Crawford sedan remains unchanged at \$4,500.

On the Dagmar sport models, a new price of \$4,500 on the sedan has been announced, the former price of \$4,250 was set before a regular production schedule was worked out. The open Dagmar models list at their original price of \$3,500.

## State of Georgia Shows Improvement in Sales

(Continued from page 896)

comprises the southeastern group of States, shows a still further betterment in financial conditions. Buying power of southeastern farmers is now at the highest point it has ever been, due to continued high cotton prices.

Sales of farm implements, including principally tractors, by the seven largest distributors in the district was 38.4 per cent better in February, 1923, than the same month in 1922.

### EQUIPMENT PRICES ADVANCING

NEW YORK, April 17—Price increases in numerous lines of automotive equipment including parts and accessories, are under way. The process has been going on for some weeks and recently is becoming much more general. Most of the announcements of manufacturers attribute price increases to higher costs of material and labor.

## Receiver Appointed to Act for Mitchell

Appointment Follows Filing of  
Bankruptcy Petition by  
Three Creditors

CHICAGO, April 19—Herbert F. Johnston, president of S. C. Johnston & Sons, paint manufacturers of Racine, Wis., was appointed receiver for the Mitchell Motors Co. of Racine by Federal Judge Ferdinand A. Geiger at Milwaukee late last night. This action followed the filing of an involuntary petition in bankruptcy by three creditors and was taken after all efforts toward financial rehabilitation of the company by a stockholders' and creditors' committee had failed.

The liabilities are approximately \$4,100,000, with estimated quick assets of about \$1,000,000 and other assets estimated at \$3,000,000, the major part of the assets being automobiles and parts of more or less speculative values.

Benjamin V. Becker of Levinson, Becker, Schwartz and Frank, the attorneys who have represented the stockholders' and creditors' committee comprising about 95 per cent of all the creditors, has made the following statement:

### Attorney Makes Statement

The appointment of the receiver was necessitated after all negotiations with prospective purchasers and investors had failed to materialize. The Mitchell company has a fine car and the committee devoted a great deal of time and attention in the effort to put the company on its feet again. While the committee was engaged in this work some of the creditors brought suit in Wisconsin and also litigation was threatened in New York which precipitated the receivership. The property will now be taken care of by the Federal Court, the rights of creditors protected, and the property conserved.

The Mitchell-Lewis Motor Co. started building the Mitchell car in the plant of the Mitchell Wagon Co., 20 years ago. The business grew rapidly, and in 1916 the present Mitchell Motors Co., Inc., was organized. The expansion resulted in the development of a plant that comprised thirty buildings with a total floor space of more than twenty-six acres, located on forty-five acres of ground. The plant's capacity was 20,000 cars annually.

### Body Company Formed

In 1920 the H & M Body Corp. was organized to take over the automobile body manufacture department of the Mitchell company, with the ownership divided equally between Mitchell and the Hupp Motor Car Co.

The capital stock of the company consists of 125,000 shares of no par value and with no funded debt. W. L. Jacoby is president, and L. S. Nold, secretary and treasurer. The directors include A. P. Warner, H. J. Halle, R. C. Schaffner, D. B. Stern, R. M. Owen, R. A. Rainey and Moritz Rosenthal.

## FINANCIAL NOTES

**McQuay-Norris Manufacturing Co.** of St. Louis has sold through a Chicago house 33,333 shares of no par value common stock, the first public offering ever made of this company's stock or securities. The stock was offered at \$25 a share and the entire issue is said to have been sold and oversubscribed in one day. Earnings available for dividends on the common stock in the past five years, it is announced, computing taxes at the 1922 rate, have averaged \$330,570, or approximately \$3.80 per share. No changes in the personnel of the management are contemplated as a result of this financing.

**Chandler Motor Car Co.** reports net profits for the first quarter of this year represented earnings of \$4.40 a share on the stock. It is said that the \$1.50 quarterly dividend rate is being earned by such a large margin that there seems to be a possibility of an extra distribution. March shipments are reported to have been 20 percent higher than those of January and February. Combined production is at the rate of 25,000 cars annually. Floor space has been expanded to increase production.

**Checker Cab Manufacturing Corp.** has declared a dividend of 83.33 cents a share on the Class A participating stock, payable May 1 to stock of record April 25, and a quarterly dividend of \$1.25 a share, payable Aug. 1 to stock of record July 16; \$1.25 payable Nov. 1 to stock of record Oct. 15 and \$1.25 a share payable Feb. 1 to stock of record Jan. 15, 1924.

**Martin-Parry Corp.** has declared a quarterly dividend of 75 cents a share payable June 1 to stock of record May 15. This is an increase of 25 cents a share as compared with the previous quarterly payments. Net profits during the first quarter this year amounted to \$172,000, as against \$72,000 required for dividends.

**Timken-Detroit Axle Co.** business in the first three months of the year approximated \$8,000,000, as compared with \$3,000,000 in the first quarter a year ago and \$2,000,000 in 1921. General prosperity of the industry and the signing of important new contracts indicate the company will have the best year in its history.

**General Motors Acceptance Corp.'s** plans to increase its capital stock from \$4,800,000 to \$6,000,000 have been approved by the New York State Superintendent of Banks. The corporation has a surplus of \$1,500,000 and undivided profits of \$400,000. It owns all the capital except the directors' qualifying shares.

**Root & Van Dervoort's** annual report shows net sales of \$1,459,300, as against \$2,760,846 the year before. After all expenses there was a net loss of \$123,573 in 1922, compared with \$271,849 in 1921. The deficit amounted to \$642,811 in 1922, as against \$1,155,266 in 1921.

**Gates Rubber Co.** has sold an issue of \$350,000 7 per cent preferred stock to Denver bond houses which shortly will make a public offering. Gross sales for the company in 1922 are reported at \$4,174,376, as compared with \$3,902,588 in 1921.

**Spicer Manufacturing Corp.** reports gross sales of \$3,586,093 for the first quarter of 1923, as against \$1,547,093 in the same period last year. March shipments were the largest in the history of the company.

**Budd Wheel Co.** stockholders will hold a special meeting June 15 to vote on an increase of the no par common stock from 50,000 shares to 100,000 shares.

## BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

The record-breaking business activity of the past few weeks continues. The March monthly total of building expenditures authorized in 155 cities exceeded \$370,000,000. This is 50 per cent greater than the previous record month of June, 1922. It shows an increase of 70.7 per cent over February, and 55 per cent over March of last year. The Bureau of the Census reports that cotton consumption in March broke all previous records with 623,105 bales. A new high mark was also established for active spindles, which totaled 35,500,518 in the month of March. This exceptional business activity has been accompanied by wage increases in several important industries.

The volume of payments by check, as shown by bank debits to individual accounts, showed a decrease of 6 per cent for the week ending April 11, as compared with the preceding week, with its large volume of end-of-month settlements. Bank debits from 244 centers for the week amounted to \$9,513,161,000, as compared with \$8,715,967,000 for the similar week last year, an increase of nearly 10 per cent. Although payments by check are made in many cases several weeks after a business transaction takes place, they constitute a useful indication of changes in business activity and credit demands.

Interest rates for commercial paper of fixed date maturity were quoted at 5½ per cent at the beginning of last week, but later all periods were quoted at 5¼ to 5½ per cent.

The last weekly consolidated statement of the 777 member banks of the Federal Reserve System in leading cities shows further increases in loans and discounts amounting to \$96,000,000 for the week. Of this total an increase of \$63,000,000 was shown in loans secured by stocks and bonds. Total investments were reduced \$24,000,000, while net demand deposits increased \$130,000,000.

## National Has New Plan as Syndicate Withdraws

**NEW YORK, April 19**—Announcement is made that the syndicate which offered \$3,000,000 National Motors Corp. first mortgage bonds for subscription has withdrawn the offering, and that the National corporation is making other arrangements to take care of its financial requirements.

An executive of the National corporation states that the new plan being considered calls for more money than the original offering which has been withdrawn, and that a statement as to its character will be forthcoming next week.

## Maxwell Earned \$11 on Its Class A Stock

Net Profits for Year, \$2,018,000—Chrysler Reviews Chalmers' History

**DETROIT, April 18**—Earnings of Maxwell-Chalmers for the first quarter of 1923 were in excess of \$1,028,000, according to a report presented by Walter Chrysler, chairman of the board, at a stockholders' meeting here yesterday. During the last year sales of the two cars exceeded \$6,000,000 in value, representing a total of 48,833 Maxwells and 5978 Chalmers, which in sales units was 5000 more than was predicted at the beginning of the year, according to Chrysler's report.

Net profits for last year from the Maxwell unit amounted to more than \$2,018,000, which was equivalent to approximately \$11 a share on Class "A" stock. Pending the readjustment of the Chalmers company, the loss for the year from Chalmers operations was \$1,186,603. Consolidated net profits amounted to \$831,661, of which \$720,714 was carried to Class "B" stock equity account.

On Jan. 1, 1922, Maxwell Motors, Ltd., of London had in stock more than 1000 passenger cars and trucks remaining from the old company. This inventory now has been completely liquidated, and the company can show a substantial profit in its 1922 business.

## Expects Chalmers Profit

Chrysler reviewed the history of the acquisition of the Chalmers physical assets during the year and believes that this unit will show a profit from the present year's operations.

The Maxwell Motors Corp. was reported to be at present in a very strong position, with no bank loans. The manufacturing plants, according to Chrysler, have sufficient capacity to produce quantities as scheduled at low cost. Cash and sight drafts have increased from \$4,449,220 on Jan. 1, 1923, to approximately \$6,000,000 at present, notwithstanding the larger volumes of material in process of manufacture.

The ratio of current assets and current liabilities on Dec. 31, 1922, was approximately 3.5 to 1. More than \$3,000,000 in funded debt was retired during the year.

Plans for the current year are based on the sale of 6000 Maxwell and 14,000 Chalmers cars.

## ROCHE ADDRESSES A. M. A.

**CHICAGO, April 14**—At the regular meeting last night of the Chicago group of the Automotive Manufacturers Association the principal speaker was J. P. Roche, vice-president and general manager of the McJunkin Advertising Co. His subject was "The Interlocking Programs," dealing with the relation of production, sales and advertising.



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## Court Gives Assent to Plans for Kelsey

### Company Will Be Reorganized and New Issue of No Par Common Stock Made

NEWARK, N. J., April 16—Judge Runyon of the United States District Court has approved the plans for the reorganization of the Kelsey Motor Co., and the officials are losing no time in getting under way. Receiver Stuart A. Young will remain in charge until the reorganization is completed. Production on 100 cars will be started at once, with manufacturing efforts concentrated on the gear car which lists at \$1,150.

There will be no change in the name of the company, as the plans stand, or in the personnel of the executives, Charles W. Kelsey remaining as president. The refinancing consists of incorporating under Delaware laws and issuing 400,000 shares of no par common stock in place of the 400,000 shares of no par common and 200,000 preferred at \$10, which the old company carried.

The creditors have agreed to the new financing terms which provide for the payment of claims either 33 1/3 per cent cash or 60 per cent first mortgage bonds, 15 per cent cash and 25 per cent stock. As yet none of the creditors has made any selection. Inasmuch as the total indebtedness amounts to only \$125,000, it is thought by the Kelsey officials that little difficulty will be experienced in putting through the reorganization.

## On Basis of 1920 Prices

### Ajax Makes Good Profit

NEW YORK, April 17—Ajax Rubber Co. directors were reelected at the annual meeting at which President Weston declared that expenses were unusually high in 1922 compared with sales, because of the low price of tires. These prices, he said, were 55 per cent below those of 1920.

At the end of the first quarter this year sales on a basis of the 1920 prices were more than \$4,000,000. This was much higher than the sales in the first quarter of 1922, which amounted to five-twelfths of the sales in the whole year of 1922.

## All Directors Re-elected by United States Rubber

NEW YORK, April 17—All directors of the United States Rubber Co. were reelected at the annual meeting here. In presenting his report, President Charles B. Steger declared that no new financing is contemplated and that the company is in a sound financial condition.

Referring to conditions in the tire field, Steger said:

The tire business has shown substantial gains in the first quarter over the corre-

sponding period of last year. As a result of the remarkable increase in automobile production, trade conditions among tire dealers indicate a largely increased demand for our products over last year. Generally speaking, conditions in the whole tire industry are much improved.

The encouragement expressed in the closing paragraph of the annual report for 1922 has been fully justified by results for the first quarter of 1923. The company's business generally has shown substantial improvement since the close of last year.

## INDUSTRIAL NOTES

The Levene Motor Co. has taken over the tract parts business of the General Ordnance Co., with plants located at Derby, Conn., and Cedar Rapids, Iowa. The parts stocks from both these plants will be moved to Philadelphia, from which point complete service will be maintained.

U. S. Products Co. of Pittsburgh, which formerly marketed its bearing fitting and valve grinding compounds through the Edward S. Cassidy Co., has installed its own sales department and will operate independently in the matter of selling.

Superb Manufacturing Co. of Monticello, Ind., has completed arrangements to manufacture the entire line of H & D products, which include H & D and Steelbilt shock absorbers for Ford cars.

## Durant Bank Not to Lend to Any of Its Officers

NEW YORK, April 19—In a statement to stockholders of Durant Motors, W. C. Durant outlines plans for the launching of his new bank, which is to have 300,000 shareholders. He is not yet ready to announce the personnel of the bank or its name, but a significant paragraph declares that no loans will be made to officers or directors of the bank or to any companies with which these officers or directors are connected in any manner.

This is interpreted to mean that Durant will not finance any of his automobile units through the bank.

## Tax Agitation Hampers Sales in Great Britain

WASHINGTON, April 16—Advises received by the Automotive Division here today indicate that prices of British made automobiles in Great Britain are at rock bottom. It is stated that English factories are increasing their production but as a rule they have not approached their productive capacity.

The reports show that the light weight car and low horsepower is rapidly replacing the more expensive types in dealers' stocks.

The Royal Automobile Club of London, representing a number of associations of car owners, has called upon Parliament to expedite the study of motor taxes and place a duty on motor fuel rather than on horsepower. It is recommended that the tax question be settled and the new taxes put in effect by Jan. 1, 1924.

## METAL MARKETS

Paradoxical as it may sound, it is nevertheless a fact that the steel market is exceedingly quiet while the steel industry could hardly be more active. Fresh buying of representative tonnages has come to a halt and even pressure for quickly wanted small tonnages has abated to a marked degree, though it could not be said to have disappeared altogether. Out-and-out price advances are not looked for, the general expectation being rather a protracted period of pegged prices on about the basis of the prevailing quotations of the independents. It is thought that the chief producing interest will adjust its obsolete prices so as to bring them into harmony with those of the independents, and that the latter will furnish a fairly dependable compass into the year's third quarter.

So far there has been nowhere in evidence a disposition to utilize the recent advance in wages as an argument for justifying still further advances in steel prices, the generally accepted interpretation being that the higher wage scales were the effect of the previous advances in the steel market. Certain it is, however, that the raise in wages was announced at the psychological moment when many consumers were beginning to look for a shift in the market's tendency, and thus the latter were furnished concrete evidence why prices cannot be lowered for the time being. The smaller mills are endeavoring to sweeten their averages as much as possible by keeping some of their capacity open for business that carries a premium without jeopardizing the continuity of their operations by lack of orders.

Producers of alloy steels for automotive consumption have recently advanced prices to the extent of about 1/4 cent per lb., bringing 3 1/2 per cent nickel steel to a 6-cent level. This advance, while expressive of the good demand, is rather in the nature of a belated adjustment, bringing the margin on alloy steels more nearly in line with those on most of the carbon steel products used by the automotive industries. Makers of cold-finished steel bars continue to complain of the inequitable rate they now obtain for conversion of 2.35 cent merchant steel bars into 3 cent cold-drawn bars, amounting to \$13 per ton.

**Pig Iron.**—Most of the automotive foundries appear to be well covered for the next eight or ten weeks, and those which are not find little trouble in provisioning themselves in single carlots. Apparently the majority of automotive castings makers see nothing in the present pig iron market situation to whet their buying appetite beyond their routine requirements.

**Aluminum.**—Demand from automotive consumers has eased off somewhat temporarily. Several hundred tons of 98 to 99 per cent pure ingots held by resellers in Detroit warehouses were offered a few days ago at 26 cents, while spot metal in the East is held at a fraction above that level. Very little foreign metal is arriving, and what does come in has been previously sold. Sheets continue in good demand and domestic rolling capacity is fully engaged for several months to come.

**Copper.**—There is a rather desultory tone to the raw copper market. Producers of wrought copper and brass have let it be understood that they are opposed to too sharp advances in the price of the red metal, lest consumers be scared out of the market for their own products.

# Calendar

## SHOWS

Nov. 4-10—New York, First Automobile Exposition of the Foreign Automotive Association, Hotel Astor.

## FOREIGN SHOWS

April 10-29—Madrid, Spain, International Automobile Exposition at the Palacio de Exposiciones, showing automobiles, motorcycles, accessories and equipment, under the auspices of the Chambre Syndicale de l'Automobile et du Cycle.

May 9-June 12—Gothenburg, Sweden, International Automobile Exhibition, Sponsored by the Royal Automobile Club of Sweden.

Oct. 4-14—Paris, Passenger Cars, Bicycles, Motorcycles and Accessories, Grand Palais.

Oct. 24-Nov. 2—Paris, Trucks, Agricultural Tractors, etc., Grand Palais.

Nov. 1-15—Buenos Aires, Annual Automobile Exposition, under the direction

of the Automovil Club Argentino.

## RACES

May 10—Berlin—Grunewald, German Grand Prix.

May 30—Indianapolis, Eleventh Annual 500-mile International Sweepstakes.

July 2—Tours, French Grand Prix 500-mile race.

Oct. 28—Barcelona, Spain, Grand Prix for vehicles of 1500 c.c.; Nov. 1, International Grand Prix for cycle cars of 1100—Nov. 4, International Grand Prix for two liter.

## CONVENTIONS

May 2, 3, 4—New Orleans, Annual Convention of the National Foreign Trade Council.

May 7-10—New York, Annual Convention of the United States Chamber of Commerce.

May 10—New York, Annual Meeting of the National Highway Traffic Association, Automobile Club of America.

May 7-12—Seville, Spain, Fourth International Highway Congress.

May 15-16—Detroit, Spring Convention of the Service Managers' Division of the National Automobile Chamber of Commerce, General Motors Building.

Oct. 24-26—Cleveland, Thirtieth Annual Convention of the National Association of Farm Equipment Manufacturers, Hotel Statler.

Nov. 12-17—Chicago, Annual Business Exhibit and Convention of the Automotive Equipment Association, Coliseum.

## S. A. E. MEETINGS

### Metropolitan Section

May 17—Speaker, F. P. Gilligan, Secretary, Henry Southern Engineering Co., Subject, Metallic Materials for Automotive Work.

### Other S. A. E. Meetings

April 26-28—Automotive Transportation Meeting of the S. A. E. to be held at the Hotel Winton, Cleveland.

Sessions will be devoted to truck, motor bus, taxicab and motor rail car transportation, featuring operation rather than design.

April—New England Section—Chassis Lubrication—C. A. Bacon—8 p.m.—Engineers Club, Boston.

June 19-23—Summer Meeting of the S. A. E.—Spring Lake, N. J.

Oct. 25-26—Production Meeting of the S. A. E.—Cleveland.

Jan. 1924—Annual Meeting of the S. A. E.—Detroit.

## MEETINGS

June 14-15—Bethlehem, Pa., Eastern Sectional Meeting of the American Society for Steel Treating, Hotel Reservations made through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem.

June 25-July 1—Dixville Notch, N. H., Summer Meeting of the Automotive Equipment Association.

## Show in Argentina Dated for November

**BUENOS AIRES, ARGENTINA,** March 27 (*By Mail*)—The annual automobile exposition, held under the direction of the Automovil Club Argentino, will be held the first fifteen days of November, according to an announcement of the show committee. The conditions for exhibition will be much the same as in previous years, the cost of exhibit space being \$20 (Argentine currency) per square meter of space. The drawing for space will take place about Sept. 30.

The annual Buenos Aires cattle show, which always draws exhibitions from many of the leading car, truck, tractor and equipment distributors, will open Sept. 1. This exposition is under the direction of the Sociedad Rural Argentina and annually attracts tremendous crowds.

Other cattle and agricultural exhibitions in the interior of Argentina, many of which will be worthy of exhibition by automotive companies, include the following:

Concordia, Oct. 7; Corrientina de Hacedados, Sept. 23; Goya (Corrientes), Oct. 7; Mercedes (Corrientes), Oct. 21; Reconquista (Santa Fe), Oct. 14; Rosario, Aug. 12; Santa Fe, Sept. 23 and Olivos (F. C. C. A.), Aug. 15.

This list is not complete for the interior fairs and exhibitions as showings of this nature are held in nearly every Argentine city some time during the late spring and early summer.

## GEARLESS MOTOR TO BE SOLD

**PITTSBURGH,** April 16—The Real Estate Trust Co. of Pittsburgh and George D. Wick, ancillary receivers of the Gearless Motor Corp., will sell the

factory and real estate of the company, located in North Franklin Township, Washington County, at the Washington County Courthouse, on May 14. The site includes 4.62 acres and is located on the Baltimore & Ohio Railroad. All bidders prior to bidding must deposit \$10,000. The sale is subject to an upset bid of \$75,000.

## S. A. E. Cleveland Dinners to Hear Three Speakers

**NEW YORK,** April 18—There will be three speakers instead of two at the automotive transportation dinner Thursday, April 26, which will be held in Cleveland under the auspices of the Society of Automotive Engineers.

Robert S. Binkerd, vice-president of the Committee on Public Relations of Eastern Railroads, has been placed on the program along with A. H. Swayne of General Motors Corp. and W. J. L. Banham of the Otis Elevator Co.

George M. Graham, of the Chandler Motor Car Co., will act as toastmaster.

The automotive transportation meeting will last two days—Thursday and Friday, April 26 and 27.

## Goodrich Votes to Retire 11,800 Shares Preferred

**NEW YORK,** April 19—At the annual meeting of the B. F. Goodrich Co., the stockholders voted to retire 11,880 shares of preferred stock, in accordance with charter provisions. All the directors were reelected, and they in turn reelected all the old officers.

The meeting of the board, which followed, declared the regular quarterly dividend on preferred stock of \$1.75 a share, payable July 2 to stockholders of record June 21.

## \$10.46 Share Earned by Auto-Lite in 1922

**TOLEDO,** April 17—Great activity in the plants of the Electric Auto-Lite Co., which are operating at capacity, are reported in the company's annual statement. The output now exceeds 3000 starters a day, with the probability that this pace will be maintained for the next six months to meet demand. Orders already booked lead to the prediction that the estimated net earnings, after interest and taxes for the first six months of 1923, will be approximately \$2,000,000.

The company plans to retire at least \$1,000,000 more of its first mortgage ten-year bonds in 1923, leaving less than \$1,000,000 to be retired in 1924.

The annual report for the year ended Dec. 31, 1922, shows net profits, after interest, taxes and depreciation, of \$2,617,046, equivalent to \$10.46 a share on 250,000 shares of common stock outstanding.

Earnings for the first quarter of the current year after interest and taxes will exceed \$800,000, an increase of more than 40 per cent over the same period in 1922. The balance sheet as of Dec. 31 showed quick assets equal to more than four and a half times quick liabilities.

## WILLYS PAYMENTS ORDERED

**NEW YORK,** April 19—Receivers Kerney and Voorhees of the Willys Corp. have been ordered by Federal Judge Bodine in Newark, N. J., to pay \$500,000 to the Ohio equity receivers for the company. With this payment, the Ohio creditors of the Willys Corp. will have received \$2,687,000 from the sale to the Durant interests of the Willys factory at Elizabeth.